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## INDEX TO VOL. XXXII

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# Index to Volume XXXII, 1919


Abrasive Soap, Slate Waste Made into.... 668
Accelerator, Automobile, Aluminum Pedal Operates ..... 752
Accident—Airplane Falls with Fifteen Passengers ..... 499
Accident—Airplane, Fog Hidden Pole Wrecks ..... 590
Accident—Airplane, Government, Children Killed in Landing of..... 407
Accident—Airplane Landing on Small Field, Crowd Crashed into by..... 591
Accident—Airplane Lands on Merry-Go-Round ..... 537
Accident—Airplanes Crash in Mid-Air, Picture of ..... 642
Accident—Auto Crushed between Cars..... 869
Accident—Auto Plunges onto Deck of Fire Tug ..... 884
Accident—Automobile Backs into River off Ferryboat Deck ..... 332
Accident—Automobile, Bridge Rail Smashed by ..... 237
Accident—Automobiles Side by Side Hit Locomotive ..... 392
Accident, Beach, Motorcycle Takes to Water in ..... 896
Accident—Blazing Dirigible Crashes through Bank Roof ..... 357
Accident—Bridge, Automobile Wrecks..... 713
Accident—Bridge, Ship Damages..... 119
Accident—Chilean Submarine Sinks..... 210
Accident—Elevated Railroad Trains in Rear End Collision ..... 731
Accident—Fire, Unusual, Wagon Load of Hay Burned by..... 542
Accident—First Aid Kits for the Mechanic.. 935
Accident—Flying Boat Hits Lock of Panama Canal ..... 58
Accident—Freight Cars Vault from Bridge.. 512
Accident—Human Body Forms Cushion for Falling Workman..... 369
Accident—Iceberg, Steamer Collides with.. 878
Accident—Largest Airplane Crashes in Trial Flight ..... 183
Accident—Logging Train, Runaway Smash-Up of ..... 258
Accident—Mine Tunnel, Powder Explosion Kills Many in..... 595
Accident—Ore Ship's Gas Filled Hole, Heroic Rescue in ..... 692
Accident Prevention, Government Issues Pamphlets for Illustrated Lectures on.... 385
Accident—Railroad Passenger Train Obstructs Crossing about Seven Seconds.... 673
Accident—Railroad Wreck, Wooden Coaches Smashed in ..... 656
Accident—Seaplane Crashes into Gas Tank. 28
Accident—Sign, Mechanical, Shows Danger of Careless Driving..... 719
Accident—Soldier Survives Plunge over Chalk Cliff in France..... 347
Accident—Starch Plant Explosion, Death and Ruin Wrought by..... 201
Accident—Street Car Dives into Pit..... 225
Accident—Street Car, Private House Entered by ..... 84
Accident—Submarine, American, Sinking of 744
Accident—Theater Crowd, Entrance Floor Collapses with ..... 666
Accident to Submarine, by John Edwin Hogg ..... 322
Accident—Trapped Miners Rescued with Aid of War Device..... 2
Accidents, Factory, Ample Lighting Prevents ..... 739
Accidents, Railroad, Fewer during "No Accident Week" ..... 569
Acetylene Gas Signal for Grade Crossings.. 876
Acetylene, Newspaper Kept Going on..... 219
Acetylene Torch, Yeggmen Burn Hole in Safe with ..... 831
Acetylene Welder, Thimble Worn by..... 453
Acid, Formic, Bees' Stings Used to Make, by Sam E. Conner..... 355
Acid, Leaking Radiators Repaired with..... 477
Acid, Nitric, and Water, Steel Colored Blue with ..... 615
Acid, Nitric or Hydrochloric, Putty Removed from Glass by..... 773
Acid, Picric, Wool Used as Filters in Making ..... 539
Acrobat, High Altitude, Lieut. Locklear as 66
Acrobat, Motorcyclist Does Beach Stunts like ..... 330
Adding Machine, Loan Totals Registered on. 53
Adding Machine Subtracts and may be Taken Apart ..... 518
Adobe Wall, Cemetery, Gateway Outlasts.. 724
Advertisement—Billboard Map for Motorists 382
Advertisement—Demonstrates Auto Dynamos without Running Engine..... 59
Advertisement—Farm Products Advertised on Signboard ..... 544
Advertisement—Iowa Victory Loan Sign of Unusual Beauty ..... 97
Advertisement—Lights, Poorly Placed, Trade Lost by ..... 158
Advertisement—Marshal Foch Done in Soap for Window Display..... 56
Advertisement—Music Store Installs Desk-like Phonographs ..... 353
Advertisement—Ocean Floor, Glass Bottom Boats Afford View of..... 593
Advertisement—Pavement Becomes Billboard for Loan Campaign..... 58
Advertisement, Steaming Coffee Cup on Electric Sign, Restaurant Uses as..... 581
Advertisement—Trucks, Diagrams on, Advertise Route of..... 590
Advertising—Loan Totals Registered on Big Adding Machine..... 53
Advertising, Novel, at Leipsic Fair..... 185
Advertising—Pony, Papier-Mâché, on Motorcycle ..... 498
Advertising—Poster, American Library Association Uses..... 752
Advertising, Postmark, for National Forests 342
Advertising—Sculpture, Signboard Builders Use ..... 91
Advertising—Sign, Misspelled, French Café Trade Increased by..... 710
Advertising Signs, Plant Sprayer Used to Make ..... 770
Aerial Insurance, Company Writes..... 894
Aerial Mail Carriers, First Year's Record of 240
Aerial Photography, School for Teaching... 276
Aerial Police, N. Y., Chase and Arrest Staged by ..... 45
Aerial Ride Rigging in Park, Sailors Mend 550
Aerial Searchlight, Dissection Work Projected by ..... 745
Aerodrome, Floating, Aeroplane Ship "Furious" is ..... 430
Aerodromes, Aeroplane Starter Saves Labor at ..... 506
Aeronautical Exposition, Holland to Hold.. 228
Aeronautics:
  Aerial Mail Service between U. S. and West Indies ..... 888
  Aerial Mail Service for Brazil Planned... 912
  Aerial Observers Adjust Fire of Big Coast Guns ..... 336
  Aerial Photographs of Pacific Fleet..... 526
  Aerial Tourists to Journey in Squadron Formation ..... 414
  Aeroplane, Baby Eight Months Old Flies in ..... 601
  Aeroplane, Conventional Design Defied in Building ..... 698
  Aeroplane Display Room, Church Auditorium Used as..... 902




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*Aeronautics: (Continued)*
Aeroplane Eclipse Expedition Hounded by Misfortune ..... 329
Aeroplane Engines, Muffler for..... 857
Aeroplane Falls with Fifteen Passengers 499
Aeroplane, Fog Hidden Pole Wrecks..... 590
Aeroplane, Government, Children Killed in Landing of ..... 407
Aeroplane in Italy Makes Record..... 510
Aeroplane Landing on Small Field, Crowd Crashed into by..... 591
Aeroplane Lands in Tree Top..... 569
Aeroplane Lands on Top of Merry-Go-Round ..... 537
Aeroplane, Largest, Prepare for Trial Trip of ..... 811
Aeroplane, Live Lobsters Shipped on..... 386
Aeroplane, 1,000 Horsepower Engine for.. 489
Aeroplane, Pilotless, Long Course Flown over by ..... 433
Aeroplane Propellers, Canvas Layers Used to Make ..... 868
Aeroplane Rides, Tubercular Lungs Strengthened by ..... 580
Aeroplane, Street Service Station "Gasses" 842
Aeroplane Taxis Land in Public Park..... 427
Aeroplane to Seaplane, Pontoon Equipment Changes ..... 668
Aeroplane to South Pole, Plans to Send... 834
Aeroplane with Supercharger, Altitude Mark Set by..... 898
Aeroplanes Crash in Mid-Air, Camera Man Turns Crank as..... 642
Aeroplanes Fly in Formation under N. Y. Bridges ..... 901
Aeroplanes, Gasoline Power Plant for.... 673
Aeroplanes, Magnesium Pistons for..... 876
Aeroplanes Survey Forests to Value Wood Pulp ..... 340
Aeroplanes Take Photographs to Make Map for Aviators..... 200
African Air Route Traced from Cairo to the Cape ..... 398
Air Craft to Link Northern Canada with Southern Ports ..... 832
Air Mail Planned for Towns in Canadian Rockies ..... 198
Air Race, International, Prince of Wales to Start ..... 432
Air Service Problems, Inventors Asked to Help Solve ..... 411
Airman Flies across South America..... 574
Airman, Floor of Yosemite Valley Landed on by ..... 682
Airman in Egypt Flies 1,100 Miles in a Day ..... 360
Airman Lands and Takes off Building Roof 689
Airman Lost on African Coast..... 666
Airmen, Sign on Roof of Aerial Station for 488
Airship Hangar for Atlantic Coast, Navy Plans ..... 557
Alcohol Fuel for Aerial Service..... 740
Applicants for Air Service, Airplanes Carry to Fields ..... 398
Architect Selects Site for Building with Airplane ..... 69
Army Air Service Offers 30 Hour Forecast to Airmen ..... 592
Army Air Service Suggests Contracts for Airplanes ..... 32
Atlantic Flight Entries Meet Crowning Mishaps ..... 354
Atlantic Spanned by Nonstop Flight, by Paul A. Jenkins..... 165
Aviation Fields, Municipal Air Service of U. S. Army Helps to Build..... 278
Barrack, Naval Airmen's, Clublike Equipment for ..... 727
Boxing Match, Aerial, Army Officers to Hold ..... 438
Brothers Build Big Seaplane for Passenger Trade ..... 576
Business Man Owns Private Hangar and Landing Field ..... 360
Camera, Triple Map Making, for Aeroplanes ..... 726
Champion Airman Presented with Jewelry 518
Chase and Arrest Staged by N. Y. Aerial Police ..... 45
Commercial Flying, Competition will Establish Cost of..... 342
Deep Sea Fishing Simplified by Seaplane. 481
Eagle, Airmen in Aeroplanes Chase..... 724
Electric Starters Supplied for Naval Seaplanes ..... 245
Electrodes in Sea Send Signals between Air Craft ..... 278
Engine Supercharger, Record Flight Made Possible by ..... 519
Engines, Aeroplane, Muffler for..... 857
Explorer, Arctic, Aeroplanes Used by..... 741
Fire Truck Reduces Aeroplane Risk..... 404
First Commercial Flight of Seaplane to Cuba ..... 194
First Transatlantic Flight Recorded in Moving Pictures ..... 424
Fliers Glide under Arc de Triomphe..... 524
Floating Seaplane Bases..... 847
Flower Laden Aeroplane, Bees Follow.... 509
Flying Boat Hits Lock of Panama Canal 58
Flying over Cities, Canadian Air Board Restricts ..... 559
"Flying Parson" First to Complete Longest Air Race, by Paul A. Jenkins..... 819
Folding Wings Transform Auto into Aeroplane ..... 349
French Spad, Three Miles a Minute Speed of ..... 823
Funeral, Aeroplane Suggested as Hearse for ..... 486
Gas Engine Theory, Dissected Engines Teach ..... 838
Germans Claim to Have Had Wireless Steered Aeroplane ..... 829
Girl Gives Letters to Officer of Aeroplane of Police Reserve Air Service..... 120
Government Builds Eastern Terminal for Aerial Mail..... 528
Gun, Aeroplane, Universal Bearing Holds 759
Hangar for Aeroplane, Inflatable..... 653
Hearse, Aeroplane Used as..... 667
Highwaymen of the Air, by Lloyd D. Lewis ..... 41
Holland to Hold Aeronautical Exposition 228
Hotel Dining Room, Replicas of Aeroplane Parts Used to Decorate..... 739
Human Albatross, The, by H. H. Windsor 37
Indicator, Aeroplane's Ground Speed Shown by..... 918
Insigne, New, for Air Craft..... 371
Insurance, British Companies Prepare for 68
Insurance, Company Writes..... 894
Interphone Helmets Worn by Airmen of Squadron ..... 246
Isolated Towns in Peru United by Aeroplanes ..... 266
Largest Aeroplane Crashes in Trial Flight 183
Liberty Plane, New York-Toronto Race Triumph for ..... 700
Lieut. Locklear as High Altitude Acrobat 66
Lightweight Napier Twelve Shows Novelties in Design..... 332
Locomotive Raising Scuttled Ship Photographed by Aeroplane..... 74
London-Paris Aeroplane Service, Business Men Value..... 884
Low Priced Biplane to Appear on Market 250
Mail Bags Dropped in Net on Roof of Federal Building..... 506
Mail Carriers Proud of First Year's Record ..... 240
Makers Expect Demand for Sporting Aeroplane ..... 13
Many Uses Seen by Authority for Airships 204
Markers, City will Construct for Airmen 734
Midget Aeroplane Reported from France 349
Midget Monoplanes Sell at Popular Price 375
Mine Owners Buy Aeroplanes to Carry Ore 116
Mississippi River Toured by Seaplanes... 554
Navy's Transatlantic Seaplane Displayed in City Park..... 337
Nine and Fourteen Cylinder Radial Aeroplane Engines ..... 188
Old Woman Flies Daily in Aeroplane..... 226
Panama Canal Air Defenses Being Planned by Army..... 335
Parachute, Propeller and Rudder on..... 433
Passengers May Walk Down Fuselage of Aeroplane ..... 102
Performances Test Airships..... 215

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*Aeronautic: (Continued)*
Physician Makes Visits with Aeroplane.. 107
Pioneer Aeroplane "Hospital," Larger Type Succeeds.... 400
Plane or Dirigible, by H. H. Windsor.... 180
Plane, Small, Built at Cost of Motorcycle 92
Portable Aeroplane Starter Saves Labor at Aerodromes.... 506
Prize for Nonstop Flight, New York to Paris.... 252
Prize Offered by Moving Picture Producer for Pacific Flight.... 218
Prize Offered for Portugal-Brazil Air Flight.... 214
Promenade Deck on Russian Aeroplane.. 74
Rickenbacher Paraded in Floral Aeroplane 373
Rules for Trans-Pacific Air Contest Announced.... 405
Seaplane Hangars at Water's Edge..... 547
Seaplane, Repair Men of Panama Canal Carried on.... 560
Seaplane Station, Seagoing Fuel Carts Used at.... 583
Seaplane Tours to Brazil and Philippines, Navy Plans.... 896
Seaplane, World's Altitude Made by..... 862
Seaplanes, Fish for Fishermen Located by 802
Seaplanes for the Congo, King Albert of Belgium Purchases.... 533
Ship "Furious" is Floating Aerodrome... 430
Sportsmen Arrange Air Race around World.... 880
"Steve Brodie" Aeroplane Landings, by John Edwin Hogg.... 262
Tandem Aeroplane is Future Air Liner... 220
Tank Trucks Supply Gasoline to Aeroplanes.... 231
Ten Years in the Air, by H. H. Windsor 179
To the Pole Via Aeroplane, by H. Egbert 679
Tractor, Midget, Aeroplanes at Naval Air Station Moved by.... 744
Transatlantic Flight Ends in Irish Bog... 416
Transatlantic Flight, The, by Paul A. Jenkins.... 19
Transatlantic Seaplane "NC-4" Visits England, by Paul A. Jenkins.... 205
Transcontinental Derby Planned by Aerial League.... 719
Value of Altitude Flights.... 500
Vertigo after Tail Spin Dangerous to Fliers.... 503
Vivid Pictures Made by Night Stunting Aeroplane.... 86
Warning Signs on Telegraph Pole Tops for Aeroplanes.... 260
Weather Conditions, Forecasting for Fliers.... 898
Western Cañons Flown over by Sight-Seeing Aeroplanes.... 37
Whirling Power Plants Lift Helicopter... 671
Woman's Altitude Record Goes to Baroness de la Roche.... 187
World Awaits Globe Circling Flight by Magellan of the Air, by Paul A. Jenkins 350
World's Altitude Record, R. Rolfs Establishes.... 649
Aeroplane, Aged Woman Flies Daily in.... 226
Aeroplane—Airmen, Atlantic City is Eastern Rendezvous for.... 210
Aeroplane, Airmen in Africa Lost with..... 666
Aeroplane Altimeters, Machine Tests Chains in.... 171
Aeroplane—Altitude Record, Woman's, French Aviatrix is Given.... 187
Aeroplane Ambulance, Removable Fuselage Bottom on.... 223
Aeroplane and Airship, Official Definition of 510
Aeroplane and Racing Car, Boy Builds..... 121
Aeroplane, Architect Selects Site for Building with.... 69
Aeroplane, Army Airman Lands on Floor of Yosemite Valley with.... 682
Aeroplane, Baby Rides in.... 601
Aeroplane—Biplane, Atlantic Spanned by Unheralded Nonstop Flight of, by Paul A. Jenkins.... 165
Aeroplane—Biplane Is Descendant of Cross Channel Bus.... 821
Aeroplane Box, Old, Dark Room Made of.... 587
Aeroplane, Business Man Owns Hangar and Landing Field for.... 360
Aeroplane Cabin, Insulated, is Business Office.... 886
Aeroplane, Caproni, American Workmen in Italy Build.... 199
Aeroplane, Commercial, Large Cabin for.... 169
Aeroplane Construction, New Plywood for.. 878
Aeroplane Construction, Waterproof Plywood for, by E. T. Bronsdon.... 419
Aeroplane, Conventional Design Defied in Building.... 698
Aeroplane, Crowded Merry-Go-Round Landed on by.... 537
Aeroplane, Curtiss, Altitude Record Established by.... 649
Aeroplane, Dead and Dying Transported by 486
Aeroplane Display Room, Church Auditorium Used as.... 902
Aeroplane, Eagle Chased by Airmen in.... 724
Aeroplane Eclipse Expedition, Misfortune Hounds.... 329
Aeroplane "Economy Run," France to Establish Cost of Flying by.... 342
Aeroplane Engine, Factory Owner Uses as Power Unit.... 676
Aeroplane—Engine Supercharger, Altitude Mark Set by.... 898
Aeroplane Engines, Radial, Have Nine and Fourteen Cylinders.... 188
Aeroplane Falls with Fifteen Passengers.. 499
Aeroplane, Floral, in Parade, Rickenbacher Honored with.... 373
Aeroplane, Fog Hidden Pole Wrecks..... 599
Aeroplane, Folding Wings Change Auto into 349
Aeroplane, Freight and Passenger Service, Railway Applies for Charter to Operate.. 171
Aeroplane Glider, Paper Used to Make.... 146
Aeroplane Glider, Toy, Feathers Used to Make.... 784
Aeroplane, Government, Children Killed in Landing of.... 407
Aeroplane Gun, Universal Bearing Holds... 759
Aeroplane, Guthrie, Ia., Owns.... 602
Aeroplane Hangar Inflates like Football.... 653
Aeroplane Hearse at First Aerial Funeral.. 667
Aeroplane, Helicopter, Inventors Still Interested in.... 109
Aeroplane "Hospital," Pioneer, Larger Type Succeeds.... 400
Aeroplane in Italy, Record Made by..... 510
Aeroplane, Inspection of Forest Fire by.... 844
Aeroplane, Juvenile, Is Push Cart..... 441
Aeroplane Kite, Three Propellers on..... 760
Aeroplane Landing on Small Field, Crowd Crashed into by.... 591
Aeroplane Landings, "Steve Brodie," by John Edwin Hogg.... 262
Aeroplane, Largest, Prepare for Trial Trip of.... 811
Aeroplane, Largest, Trial Flight Ends in Crash.... 183
Aeroplane, Live Lobsters Shipped on..... 386
Aeroplane, Locomotives Raising Scuttled Ship Photographed by.... 74
Aeroplane, Training, How to Build..... 468
Aeroplane—Low Priced Biplane to Appear on Market.... 250
Aeroplane Mail, Government Builds Eastern Terminal for.... 528
Aeroplane Mail Service between U. S. and West Indies.... 888
Aeroplane Mail Service Same as Railroad Service.... 580
Aeroplane, Mid-Air Leaps from Aeroplane to.... 66
Aeroplane, Midget, French Offer at Popular Price.... 375
Aeroplane, Midget, Reported from France... 349
Aeroplane Models, America Has Biggest and Best Wind Tunnel for Testing..... 402
Aeroplane Motor, Liberty, Development of.. 681
Aeroplane Motors, Government Loses on Sale 416
Aeroplane, Movie Director Finds Locations Easily with.... 839
Aeroplane, Night Stunting, Vivid Pictures Made by.... 86
Aeroplane of Police Reserve Air Service, Girl Giving Letter to Officer of..... 120
Aeroplane, 1,000 Horsepower Engine for.... 489

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Aeroplane Parachute, Pocket under Fuselage Holds ..... 264
Aeroplane Parts, Clock Made of, by Airman. 439
Aeroplane Parts, Hotel Dining Room Decorated with Replicas of..... 739
Aeroplane Parts, Racing Auto Made from... 48
Aeroplane, Passengers may Walk down Fuselage of ..... 102
Aeroplane Photograph, Helmet on Statue of Liberty Shown by..... 872
Aeroplane, Physician Makes Visits in..... 107
Aeroplane, Pilotless, Long Course Crossed by 433
Aeroplane Pin, Champion Airman Presented with ..... 518
Aeroplane, Poultry Purchases Floating Behind ..... 229
Aeroplane—Prize for Nonstop Flight, New York to Paris..... 252
Aeroplane Propellers, Canvas Layers Used to Make ..... 868
Aeroplane Propellers, Water Craft Tested with ..... 401
Aeroplane, Rice Grower to Use..... 484
Aeroplane Rides, Tubercular Lungs Strengthened by ..... 580
Aeroplane Risk, Fire Truck Reduces..... 404
Aeroplane, Russian, Promenade Deck on.... 74
Aeroplane Service, London-Paris, Business Men Value ..... 884
Aeroplane Ship "Furious" is Floating Aerodrome ..... 430
Aeroplane, Shock Recorder for..... 664
Aeroplane, Sporting, Makers Expect Demand for ..... 13
Aeroplane Starter, Labor Saved at Aerodromes by ..... 506
Aeroplane, Street Service Station "Gasses".. 842
Aeroplane, Tandem, as Future Air Liner.... 220
Aeroplane Taxis, Park Used as Landing Place for ..... 427
Aeroplane, Three Miles a Minute Speed of.. 823
Aeroplane—Tilted Disk Replaces Crankshaft in Rotary Motor..... 841
Aeroplane to Inspect Roadway Work, Contractor Uses ..... 889
Aeroplane to Seaplane, Pontoon Equipment Changes ..... 668
Aeroplane to South Pole, Plans to Send..... 834
Aeroplane, To the Pole in, by H. Egbert.... 679
Aeroplane Tourists to Journey in Squadron Formation ..... 414
Aeroplane Trains Promised..... 802
Aeroplane, Tree Top Landing Place of..... 569
Aeroplane—Triplane Bomber, English Advocate Use of..... 173
Aeroplane, Velocipede Drives..... 601
Aeroplane, Vertical Rising, Whirling Power Plants Lift ..... 671
Aeroplane, Wireless Steered, Germans Claim to have Had..... 829
Aeroplane, Young Chinaman Builds..... 280
Aeroplanes—Air Race, International, Prince of Wales to Start..... 432
Aeroplanes, Air Route Traced in Africa for. 398
Aeroplanes, Arctic Explorer to Use..... 741
Aeroplanes, Army Air Service Suggests Contracts for ..... 32
Aeroplanes, Atlantic Flight Entries Have Mishaps to ..... 354
Aeroplanes—Barrack, Naval Airmen's, Equipped like Club..... 727
Aeroplanes—British "Napier 12" Motors.... 332
Aeroplanes, Coast Guns' Fire Adjusted by... 336
Aeroplanes Crash in Mid-Air, Camera Man Turns Crank as..... 642
Aeroplanes—European Air Firms Propose Routes for South America..... 348
Aeroplanes, Fishing Industry in Sardinia to be Promoted by..... 322
Aeroplanes—Gas Engine Theory, Dissected Models Teach ..... 838
Aeroplanes, Gasoline Power Plant for..... 673
Aeroplanes—Government Concrete Hangar is Fireproof ..... 203
Aeroplane's Ground Speed Shown by Indicator ..... 918
Aeroplanes—Highwaymen of the Air, by Lloyd D. Lewis..... 41
Aeroplanes, Holland to Hold Exposition for Displaying ..... 228
Aeroplanes, Isolated Towns in Peru United by ..... 2
Aeroplanes—Liberty Engine, Triumph for.. 7
Aeroplanes, Magnesium Pistons for..... 8
Aeroplanes, Mail, Alcohol Used as Fuel for. 7
Aeroplanes, Map Making, Triple Camera for 7
Aeroplanes—Markers, City will Construct for Airmen ..... 7
Aeroplanes, Midget Tractor at Naval Air Station Moves ..... 7
Aeroplanes, Miniature, Boys Make..... 3
Aeroplanes, N. Y. Bridges Flown under by.
Aeroplanes, Northern Canada and Souther Ports to be Linked by.....
Aeroplanes, Panama Canal Defenses to Include .....
Aeroplanes, Parisian Arch Flown under by
Aeroplanes, Rats Devour Casein Glue on...
Aeroplanes, Sight-Seeing, Used over Western Cañons .....
Aeroplanes, Silent Motor and Propeller for.
Aeroplanes Survey Forests to Value Woo Pulp .....
Aeroplanes, Tank Trucks Supply Gasoline t
Aeroplanes to Carry Ore, Mine Owners Buy
Aeroplanes—Transcontinental Derby Planne by Aerial League.....
Aeroplanes, U. S. Map to be Made from Photographs Taken by.....
Aeroplanes—Value of Altitude Flights.....
Aeroplanes, Vertigo After Tail Spin Dangerous to Fliers of.....
Aeroplanes, Warning Signs on Telegrap Pole Tops for.....
Agricultural Implements:
Automotive Thresher Goes from Shock t Shock .....
Beet Harvester, Motor Digs, Tops, an Loads .....
Canada Receiving Large Shipments o Tractors from U. S.....
Corn Shock Binder.....
Crane, Wagon Bed Lifted Off with.....
Cultivator and Harrow Combined.....
Farm Tractor, Homemade.....
Farm Tractors, Improvements in Rei Drive System for.....
Farm Truck Has Appliances for Handlin Fertilizer .....
Farmer Makes Tractor Help Build Barn.
Garden Rake, Attachment for.....
Handle, Common, for Hoe, Weeder, Tur Trimmer, and Trowel.....
Harrow, Attachment Saves Time in Cleaning .....
Hay Crane, Barn Space Utilized wit Aid of .....
Hay Loader Machine.....
Hoe, Weeder, Turf Trimmer, Trowel, Common Handle for.....
Kerosene Burning Tractor, Novel Driving System for .....
Manure Loader, Rotary Pitchfork on....
Motor Cultivator, Grass Mower for Gol Links Made of.....
Plow, Stump Jumping, Hinge in Beam of
Potato Loader, Crop Carried from Digge to Wagon by.....
Potato Planter, Furrows Dug by.....
Potato Planter, Simple.....
Rake, All Around, for Fruit Tree Cultivation .....
Runner Cutter, Strawberry Beds Ker Clean by .....
Self-Threading Hay Press, Improvement on .....
Shelter, Damage for Lack of .....
Steel Terracing Machine Prevents Soil Erosion .....
Thresher and Harvester Deliver Grain to Wagons .....
Thresher for Broom Corn.....
Threshing Machine, Little, Boon to Farmers .....
Tractor, Ballast Carried in Hollow Wheels of .....
Tractor Blades, Beans Harvested with....
Tractor Cultivator for Garden, Students Build .....
Tractor Operated Harvesting Machines...


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*Agricultural Implements: (Continued)*
Tractor, Trees Sawed Down by..... 495
Trowel, Weeder, Hoe, Turf Trimmer, Common Handle for..... 114
Wagon Wheel, Greasing of without Removal ..... 781
Weed Exterminator, Soil Pulverized by... 884
Weeder, Hoe, Turf Trimmer, Trowel, Common Handle for..... 114
Weeder Made from Carpet Beater..... 473
Wire Hoe for Garden Use..... 137
ulture:
Adjustable Garden Trellis..... 126
kansas Canning Clubs Arouse Men's Interest ..... 191
mboo Grove, Experimental, Planted in eorgia ..... 845
n from Cliff Dwelling Sprouts Like Any ther ..... 74
et Growers, Net Used in Unloading rops of ..... 196
lb Garden in Washington State Maintained by Department of Agriculture.. 572
nkhouse for Farm Labor..... 640
nada Has only 39 Million Acres under ultivation ..... 905
n Borers, Liquid Fire and Steam Used o Kill ..... 585
nberry Pests, Pacific Coast Growers estroy ..... 730
ssbred Fruits and Grains Disease Proof, y R. H. Moulton..... 562
tivating Ground Around a Tree..... 138
m, Simple Bridges for..... 446
rmers' Associations Build Concrete rain Elevators ..... 209
rtilizing Powder Serves as Spraying olution ..... 568
rest Fire Protection Now Extended to ear By Fields..... 212
it Keeps Better When Carefully Picked nd Packed ..... 294
it Pickers and Painters, Hooks and oxes on Ladder Aid to..... 450
rden Platform, Flower Pots, Inverted, upport Plank as..... 133
rden Trellis, Adjustable..... 126
s, Carbon Bisulphide, Field Rodents Killed with ..... 771
ss Mat for Gardener..... 611
estigation of Farming Encouraged by ritain ..... 334
gation, Gasoline Engine Pumps Water or ..... 718
dzu Valuable Forage Plant, by Robert L. Moulton ..... 104
squito Larvae, Oil Soaked Sawdust in tice Fields Destroys..... 752
tor Truck Express Boon to Farmers... 213
untain States Raise Bumper Wheat rop ..... 384
ving Pictures, Potato Disease Shown by 752
s, Shoes Stretched with..... 447
eapple Growers, Association Formed by 747
mp Fertilizing Material from Michigan akes ..... 486
lief Map of Texas, Resources Shown on 894
er Nile, Engineers Propose Reservoirs or ..... 566
mer Cutter Keeps Strawberry Beds lean ..... 175
enteen Year Locust Is Interesting isitor ..... 188
ep to Graze on European Battle Fields 375
lls Clear Big Timber from Russian arm Lands ..... 340
nboard, Farm Products Advertised on. 544
diers and Sailors Receive Instruction n Farm Training..... 555
eet-Clover Seed, Tin Can Used to Gather 792
bacco Plant, Steam Road Roller Sterilizes Soil for..... 705
mato Plant Trellis, Twisted Wire Forms 153
eat, 150 Varieties, Experts Write Biographies of ..... 94
ck, Seedlings Watered by..... 291
Wire Hoe for Garden Use..... 137
Air Circus, Balloon Parade in..... 103
Air Clamp for Drill Press..... 614
Air, Compressed, and High Pressure Water Streams, Logs Raised by..... 278
Air, Compressed, Typewriter Cleaned by.... 937
Air Compressor, Motor Racers Aided by..... 427
Air Contest, Trans-Pacific, Rules for..... 405
Air Craft, Gasoline Power Plant Fitted for.. 673
Air Craft, New Insigne for..... 371
Air Craft, Signals Sent by Electrodes in Sea between ..... 278
Air Currents, Army Uses Balloons in Studying ..... 88
Air Drive, European Locomotive Propelled by ..... 913
Air Firms, European, Routes for South America Proposed by..... 348
Air Flight, Portugal-Brazil, Prize Offered for 214
Air, Heated, Gives Rigid Aluminum Balloon Buoyancy, by R. C. Busbey..... 501
Air Highways, U. S. and Canada to Have Maps of ..... 244
Air Liner, Future, Tandem Aeroplane as... 220
Air Liner, Germany Adds to Commercial Fleet ..... 663
Air Mail, Canadian Rockies to Have..... 198
Air Motors, Augers Operated by..... 747
Air Nozzle, Carbon Removed from Cylinders by ..... 779
Air Operated Scraping Tool for Metal Castings ..... 734
Air Pressure, Oil Forced from Barrel by.... 779
Air Propelled Boats, Missouri River to be Navigated by ..... 385
Air Propellers for Boats, Trial of..... 401
Air Race around World, Sportsmen Plan.... 880
Air Race, International, Prince of Wales to Start ..... 432
Air Risks, Insurance Companies Underwriting ..... 236
Air Route Traced from Cairo to the Cape... 398
Air Service, London-Paris, Business Men Value ..... 884
Air Service of U. S. Army, Cities Help Build Aviation Fields ..... 278
Air Service Problems, Inventors Asked to Help Solve ..... 411
Air, Simple Method of Weighing..... 634
Air Station, Naval, Aeroplanes Moved by Midget Tractor at..... 744
Air Station, Naval, Fatal Seaplane Crash at. 28
Air Trip across Pacific, Moving Picture Producer Offers Prize for..... 218
Air, Upper, German Artillery to Test..... 438
Airdrome, Permanent, Albany (N. Y.) to Establish ..... 2
Airman, Champion, Jewelry Given to..... 518
Airman, Clock of Aeroplane Parts Made by. 430
Airman, Floor of Yosemite Valley Landed on by ..... 682
Airman in Egypt Flies 1,100 Miles in a Day 360
Airman, Landing and Take Off from Roof Made by ..... 689
Airman, South America Crossed and Recrossed by ..... 574
Airman's Neck, Broken, Improvised Apparatus Used to Cure..... 185
Airmen, Army, Exhibition for Prizes Prohibited for ..... 119
Airmen, Atlantic City is Eastern Rendezvous for ..... 210
Airmen, Cheesecloth Tank Built to Fool.... 367
Airmen, City will Construct Markers for.... 734
Airmen in Aeroplanes, Eagle Chased by.... 724
Airmen, Interphone Helmets Worn by..... 246
Airmen Lost on African Coast..... 666
Airmen, Map Making, Triple Camera for.... 726
Airmen, Naval, Club like Barrack for..... 727
Airmen Observers, Training, by Percival E. Jackson ..... 113
Airmen, Parachute with Propeller and Rudder for ..... 433
Airmen, Sense of Fear is Lost and Coming Smash Hypnotizes ..... 98
Airmen, Sign on Roof of Aerial Station for.. 488
Airmen, Training, Tail Spin and Nose Dive Cause Many Fatalities to..... 94
Airmen, Transcontinental Race for..... 719
Airmen, Vertigo After Tail Spin Dangerous to ..... 503
Airmen, Warning Signs on Telegraph Pole Tops for ..... 260

Digitized by Google

Airship—Aluminum Dirigible, Rigid, Heated Air Gives Buoyancy to, by R. C. Busbey.. 501
Airship and Aeroplane, Official Definition of 510
Airship—Balloon, Free, Floats over New York City ..... 912
Airship, Blazing, Crashes Through Bank Roof 357
Airship, "Bodensee," Germany Adds to Commercial Fleet ..... 663
Airship—Dirigible, Atlantic Ocean Scene of Pioneer Round Trip of, by Paul A. Jenkins ..... 326
Airship—Dirigible Blown Helplessly about North Atlantic ..... 370
Airship—Dirigibles, Germany Plans Service to America with..... 566
Airship—Electric Dirigible Proposed to Carry Mail ..... 239
Airship Hangar for Atlantic Coast, Navy Plans ..... 557
Airship—Houses Shaken by Explosion of Dirigible ..... 426
Airship—Passenger Dirigible will Cruise to Brazil ..... 570
Airship, Rigid, British Experts in Construction of, by Paul A. Jenkins..... 644
Airship—"R-34," American Newspaper Carried by ..... 574
Airship, World's Largest, Britain Building.. 554
Airships—Balloons, Valve Maintains Uniform Pressure in..... 810
Airships, Coast Guns' Fire Adjusted by..... 336
Airships—European Air Firms Propose Route for South America..... 348
Airship's Fabric Lifeboats, Ballonets Inflate 665
Airships, Many Uses Seen by Authority for. 204
Airships, Model, American Wind Tunnel for Testing ..... 402
Airships, Panama Canal Defenses to Include 335
Airships, Performances Test..... 214
Airships, Ring Shaped Hangar Subway for.. 106
Alarm and Lock, Auto, Tubular Bumper Conceals ..... 393
Alarm Bell on Automobile, Warning Given by ..... 676
Alarm, Burglar or Fire, with Selenium Cell, Light Rays Operate..... 224
Alarm Clock for Store..... 310
Alarm, Electric, on Wrist Watch..... 758
Alarm, Fire, Electric Motor Operates Gong Hammer of ..... 720
Alarm, Fire, Fuse Controls Mechanism of... 746
Alarm System, Drowning in Lake Merritt Prevented by, by C. W. Geiger..... 729
Alcohol and Sugar, New Process Aids Producers of ..... 848
Alcohol, Calcium Carbide Used to Make..... 536
Alcohol Fuel for Aerial Service..... 740
Alkaloid, New, from Desert Shrub..... 919
Allen, Clarence F.:
Smokeless Powder ..... 221
Allies in Russia Campaign amid Strange Surroundings ..... 230
Alloys, Molten, Device Prevents Oxidation of 517
Altar of Victory, Jeweled, on Chicago's "Victory Way" ..... 60
Altimeters, Aeroplane, Little Machine Tests Chains of ..... 171
Altitude Flights, Value of..... 500
Altitude Record, Woman's, French Aviatrix is given ..... 187
Altitude Record, World's R. Rolfs Establishes ..... 649
Altitude Record, World's, Seaplane Makes.. 862
Aluminum Case, Shaving Articles Inclosed in ..... 922
Aluminum Pedal, Automobile Foot Throttle Operated by ..... 752
Aluminum Stamp Moistener, Perforated Cap on ..... 835
Aluminum, Switzerland Produces Several Solders for Use with..... 368
Aluminum Wire, Hair Curler Made of..... 435
Aluminum Work, Nickel Pointed Soldering Copper for ..... 299
Amber, Imitation, Treated Gelatin Used to Make ..... 561
Ambidexterity, French Schools to Teach.... 6
Ambulance, Aeroplane, Fuselage Bottom Adjustable on ..... 223
Ambulance, Convertible Limousine Becomes 581
Ammunition Tests, Many Cartridges Required for ..... 586
Ammunition, War, Use of Liberty Loan Money Shown in Government Exhibit of... 95
Amusement Park, Sailors Mend Rigging on Aerial Ride in..... 550
Anarchists, Bombs Sent Through Mail by... 55
Anatomy, Moving Pictures Used in Studying 544
Anatomy, Study of Deformities Developed by "Mensurgraphy," by Robert H. Moulton 361
Anchor Chain Shackles, Motor Driven Screws Test ..... 170
Anchor, Nozzle, Firemen's Places Filled by. 101
Anchors for Fishing Boats, Pulley Operates 313
Anderson James:
The World's Greatest Phosphate Mines... 387
Adrenalin, Dye Laboratory Source of..... 863
Angle Irons, V-Blocks Made from..... 312
Animal, Ancient Racing Regulation Bars... 426
Animal Proof Automobile Gates..... 693
Animals:
Bat Roost, Municipal, Mosquitoes and Malaria Eliminated by..... 392
Bear Cub, Automobile Mascot is..... 600
Beef Cattle, Beet Sugar By-Products Fatten ..... 413
Boars, Wild, Camera Catches..... 837
Buffalo Calf, Canadian Shriners Take to Buffalo ..... 120
Camel Caravans, Chinese, Trucks Displace 423
Camels, Demobilizing, by G. F. Paul..... 545
Cat, Rabbit Carried Home by..... 281
Cattle, Apple Pomace Fed to..... 399
Cattle, Wild, Trap for Catching..... 636
Dog, Seal Mothered by..... 281
Dog, "Vic," German Sausage Refused by.. 121
Dogs and Cats, Hotel in London for..... 680
Escaped Lioness Drives Townspeople to Cellars ..... 55
Field Rodents, Carbon Bisulphide Gas Kills 771
Fire Hydrants, Bucket for Horses Attached to ..... 91
Giraffe, Stubborn, Carried to Winter Quarters ..... 840
Goats, War Gases Tested on..... 503
Horses Compete with Automobiles in Nation's Capital ..... 744
Horses, Street Sprinkler Wagons Haul Water to ..... 893
Horses, Tractor Displaces..... 706
Lion, "Pershing," Children Celebrate Birthday of ..... 281
Lioness, Automobile on Road Kills..... 96
Lizards, Southern Swamps Furnish for Greenhouses ..... 724
Marine, Boat Collects for Aquarium..... 741
Mine Mules, Shower Bath for..... 14
Monkeys, Typewriter and Wading Pool for ..... 812
Pigs, Cafeteria System for Dispensing Food to ..... 202
Portable Scale for Weighing Hogs..... 838
Raccoon Trap, Mirror Bait for..... 319
Reindeer and Musk Ox, Explorer Designates Northern Canada as Favorable Grazing Land for..... 62
Roof of Taxidermist's Shop Piled High with Antlers ..... 96
Sea Lions Track U-Boat by Sound of Motors ..... 2
Sheep Shearing, Wool Baling Press Works during ..... 44
Sheep to Graze on European Battle Fields 375
Shipworms, Panama Canal Infested with.. 868
Squirrels, Ground, Auto Exhaust Kills.... 614
Trap, Live Bait..... 792
Wild Carcasses Fed to Poultry by Trappers ..... 756
Wild Kangaroo, Rare Picture of..... 601
Wild Life Experiment Station, Japan Plans ..... 864
Wire Basket on Automobile Running Board for Dog..... 787
Ankle Brace, Arch Support, and Toe Lifter Combined ..... 758
Antennæ, Wireless, Trees Used by Army as. 39
Anthem, National, Pictures Used to Teach.. 209
Antimony for Ignition Surface of Safety Match Box, Substitute for..... 810
Antlers, Roof of Taxidermist's Shop Piled High with ..... 96


Digitized by Google

Ants and Insects, House Made Proof Against 302
Anvil, Blacksmith's, Method for Fastening to Block ..... 770
Anvil, Blacksmith's, Scale on..... 771
Anvil for Auto Rivets, Triple Gear..... 312
Anvil, Method for Fastening to Block..... 770
Apartment Buildings, Collective Ownership of ..... 506
Apartment Houses, Newspaper and Package Rack for ..... 797
Apartment, One Room, Turntable Provides Conveniences of Four Rooms for..... 338
Apiculture—Bees' Stingers Make Profitable Crop, by Sam E. Conner..... 355
Apiculture—Canadian Develops System for Raising Queen Bees..... 648
Apple Cider, Evaporator Makes Jelly of.... 363
Apple, Golden, Girl's Beauty Prize is..... 78
Apple Pomace, Cattle Fed on..... 399
Apple Tree, Thirty-Six Fruit Varieties from 888
Apprenticeships, Calendar Estimates..... 780
Aquarium Collecting Boat, Specimen Well in 741
Aquarium Records, Long Lives of Captive Fish Shown by..... 664
Aquarium, Sporting Goods Store Has..... 823
Aqueduct, Concrete, Swamps Impede Builders of ..... 559
Arc Carbon, Novel, French Invent..... 524
Arc Lamp, Portable, for Moving Picture Work ..... 265
Arc Light Carbons, Lamp Shows Position of 147
Arch, Concrete, Costly Theater Has..... 408
Arch for Croquet Visible in Twilight..... 592
Arch, Longest, Concrete Bridge Claims..... 863
Arch, Memorial, over Business Street..... 823
Arch, Parisian, Fliers Glide Under..... 524
Arch Support, Ankle Brace, and Toe Lifter Combined ..... 758
Arch, Victory, Returned Soldiers March through ..... 750
Archæologists, Prehistoric Texas Tribes Studied by ..... 170
Arches, Portable, Concrete Bridge Building Simplified by ..... 753
Archery—Arrows, Cheap, Cattail Stems Used to Make ..... 150
Architect, Building Site Selected with Aeroplane by ..... 69
Architecture—American Housing Methods for Rebuilding France..... 332
Architecture—Building Rustic Summer House ..... 639
Architecture—Bungalow, Auto Trailer is... 319
Architecture—Bungalow for a Small Lot and a Slim Purse..... 160
Architecture—Farmstead, Engineering Plan Used to Lay Out..... 480
Architecture—Shelter House is Pumping Plant ..... 960
Architecture—Tower Ancient, Made to Order for American in France..... 77
Arcs, Incandescent Lamps Run in Series with ..... 4
Arm, Artificial, Cutlery and Tools Attached to ..... 442
Armistice Day Battle Line, Crude Monument Marks ..... 697
Armor, Ancient, Museum Displays..... 832
Armory, Sinking, Rebuilding of..... 517
Army Air Circus, Balloon Parade in..... 103
Army Field Kitchen, Boy "Hikers" Served Meals by ..... 236
Army Masks Made Proof against Absorption of Gas ..... 584
Army, Regular, Educational Opportunities Offered Men in..... 164
Army Tractors, Officers Recommend Odd Forms of ..... 676
Army University, American, Built on Large Scale in France..... 53
Arnold, Frank R.:
A Sheep Herder's Home..... 189
Arrows, Cheap, Cattail Stems Used to Make. 150
Arsenal, American, Powerful Tanks Built by 827
Arsenal Safety Exits, Chutes Used as..... 587
Arsenate of Lead, Truck Tree Sprayer Uses. 565
Art, American Soldiers Study in German School Building ..... 749
Artillery, Anti-Aircraft, Calculator for.... 912
Artillery, Coast, College Courses to be Revised in ..... 56
Artillery Evolution, Tractor Mounted "75" Caps ..... 204
Artillery, German, Upper Air to be Tested with ..... 438
Artillery, Prizes Offered for Essays on..... 800
Artist, Crippled, Brush Held in Teeth by.... 554
Artist, Hermit, Seashore Cottage of..... 732
Artist, Pictures on Automobile Painted by.. 200
Artist's Model Gallows Used to Hoist..... 803
Artists' Paintings, Flax Seed Yields Limpid White Oil for..... 676
Artists, Sketching Board for..... 769
Asbestos, Fire Kindler Made of..... 150
Asbestos Gaskets for Auto Exhaust Pipe, Securing ..... 292
Asbestos Plaster, Concrete Protected from Heat with ..... 504
Ash Chute, Steps in Kitchen Saved by..... 144
Ash Tray, Safety Match Tape on..... 915
Ashes and Coal, Single Mechanism in Paper Mill Handles ..... 570
Ashes, Vacuum Cleaner Truck Removes.... 504
Asphalt in Lake, Shifting, Boring Tools Bent by ..... 526
Asphalt or Concrete Mixer, Street Roller Equipped with ..... 202
Asphalt Pavement, Cobblestones Used as Base for ..... 913
Asphalt Road, Concrete Strip Prevents Skidding on ..... 90
Asphalt, Slate Waste of North Wales to be Made into ..... 668
Asphaltum Paint, Auto Engine's Finish Renewed by ..... 461
Asphyxiation, Automobile Exhaust Gas, First Aid Treatment for..... 717
Assay Office Vaults in New York Largest in World ..... 364
Astronomers, Gas Cloud on Sun Observed by 200
Astronomy—Sun, Annular Eclipse of, by L. J. Wilson ..... 757
Atlas, Geographic and Industrial, for Blind of Great Britain..... 263
Atom, Scientists Deny Motion of Electrons in 244
Attic, Disappearing Stairway for..... 940
Auditorium of Church, Glass Sounding Board for ..... 558
Auditoriums, Memorial, World War Veterans to be Honored by..... 713
Auger Bit, Holes Smoothed by..... 592
Auger Bits, Removable Parting Lip for..... 286
Auger Holes, Removing Shavings in..... 604
Augers, Pneumatic Motors Operate..... 747
Automobile Accessories, Auxiliary Windshields as ..... 329
Automobile Ambulance like Limousine..... 581
Automobile Association, Stretcher Bearing Motorcycles Run by..... 56
Automobile Axle, Drain Holes Drilled in.... 300
Automobile Axles, Rear, Removing Grease from ..... 605
Automobile Backs into River off Ferryboat Deck ..... 332
Automobile—Balls in Spark Plug, Loose Carbon Kept Away by..... 49
Automobile, Beds, Lavatory, and Kitchen in. 15
Automobile Body and Fender Dents, Removing ..... 290
Automobile Body, Camping Outfit Hidden in 195
Automobile Body, Cashier's Office in..... 694
Automobile Body for Salesman..... 925
Automobile, Bridge Rail Smashed by..... 237
Automobile Bus for Alaska Trails..... 371
Automobile Bus Tire, Solid, Mileage Record Established by ..... 188
Automobile, Carburetor Not Used on..... 172
Automobile "Carryall," Poor of Harrisburg, Pa., Ride in..... 911
Automobile, Cars Crush..... 869
Automobile, Celluloid Window in Top, Ordinary Paper Clips Used to Fasten..... 135
Automobile Chassis, Home Built on..... 693
Automobile Chassis, Railroad Tractor Made of ..... 324
Automobile, Chinese Boy Helps to Make.... 761
Automobile Controls, Mechanical Iron Man Operated with ..... 228
Automobile, Demonstrating Engine Carried on ..... 396
Automobile Doors, Noise Absorber for..... 442
Automobile Doubles in Road Mirage..... 804


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Automobile, Drag to Grade Lawn Pulled by. 98
Automobile Driver, Rubber Sole Tip for Shoe of ..... 914
Automobile Drivers, Billboard Map Aid to... 382
Automobile Drivers, Novel Sign Warns of Hill ..... 751
Automobile Drivers, Women, Britain Asks Uniform Skill of..... 360
Automobile Driving, Careless, Mechanical Sign Shows Danger of..... 719
Automobile Driving, Cautious, Signs on Cars Urge ..... 378
Automobile Dynamos Demonstrated without Running Engine..... 59
Automobile Electric Wiring, Inner Tubes as Insulators for ..... 297
Automobile Engine, Curious Boat Driven by 541
Automobile Engine Cylinders, Air Nozzle Removes Carbon from..... 779
Automobile Engine, Device Stops When Oil Runs Low ..... 442
Automobile Engines, Filter for Oil Removed from ..... 296
Automobile Engine's Finish, Asphaltum Paint Renews ..... 461
Automobile Engines, Old Auto Horn Locates Knocks in ..... 139
Automobile Exhaust Gas Poisoning, First Aid Treatment for..... 717
Automobile Exhaust, Ground Squirrels Killed with ..... 614
Automobile Exhaust Pipe, Asbestos Gaskets Secured on ..... 292
Automobile, Extra Front Seat for..... 939
Automobile Filling Station, Cool Drinks Sold at ..... 590
Automobile Filling Station, Limousine Used as Office by Cashier of..... 694
Automobile—Float, Storage Cell Electrolyte Level Indicated by..... 136
Automobile Flywheel Starter, Steel Ring Gear Fits ..... 218
Automobile, Foot Power, Europeans Use... 809
Automobile Foot Throttle, Aluminum Pedal Operates ..... 752
Automobile for Field Work, Living Quarters Provided in ..... 49
Automobile Frame, Identify Car by Holes Drilled in ..... 615
Automobile Garage, Driveways to Three Floors of ..... 690
Automobile Gasoline Tank, Cylindrical, Spare Tires Carried on..... 736
Automobile Gasoline Tank, Soap Plugs Leak in ..... 952
Automobile Gasoline Tanks, Empty, Explosions in ..... 781
Automobile—Gasoline Tubings, Punch and Die for Flaring..... 141
Automobile Gates, Animal Proof..... 603
Automobile Gear Lever Handle, Chewing Gum Used to Repair..... 797
Automobile Grease Cup, Handle on Cover of 922
Automobile, Greased Stick Removes Nuts Dropped in ..... 449
Automobile Grease Gun, Cement Applied to Building with ..... 775
Automobile Grease Gun, Paper Makes Substitute for ..... 782
Automobile Headlights, Garage Lighted with 140
Automobile Heater, Sink Drain Used to Make ..... 149
Automobile Highway, International, to Connect Americas, Plan for..... 352
Automobile Horn, Hand Operated, under Hood ..... 126
Automobiles, Horses in Nation's Capital Compete with ..... 744
Automobile Inner Tube, Bandage Covered with ..... 955
Automobile Inner Tube, Tire Boot Fastens around ..... 829
Automobile Inner Tube, Tool Case Made from ..... 793
Automobile, Japanese, Motor under Seat of. 602
Automobile, Japanese, Weighs 120 Pounds.. 820
Automobile, Laborers' Train Pulled by..... 748
Automobile Lamps, Punching Holes in..... 445
Automobile, Lawn Mowers Drawn by..... 301
Automobile, Lioness in Road Killed by..... 96
Automobile Lock and Alarm, Tubular Bumper Conceals ..... 393
Automobile Lock, Strap Hinge Used to Make 286
Automobile Mat, Linoleum Riveted on..... 610
Automobile, Mechanical, on Incline..... 440
Automobile, Metal Armored Inner Tire for.. 598
Automobile, Metal Tire Case Designed for... 510
Automobile, Miniature, is Air Cooled..... 653
Automobile Motor Pistons, Tool for Fitting. 778
Automobile Motor, Street Car Trailer Propelled by ..... 750
Automobile Motor, Thermostatic Valve Feeds Water Vapor to..... 244
Automobile Motors, Wood Burning Engines Supplanted by ..... 568
Automobile—Mounted Aeroplane Starter, Labor Saved at Aerodromes by..... 506
Automobile, Parked, Chauffeur Locates Cars in Rear by Window Reflections..... 456
Automobile Parking Signs, Standard, Portland Adopts ..... 102
Automobile Parts, Jet of Steam Cleans..... 898
Automobile Parts, Old, Motorcycle Car Made of ..... 741
Automobile Parts, Overhead Rack for..... 614
Automobile, Peanut Stand on Disguises..... 738
Automobile Pedal, Low Speed Latch for... 461
Automobile, Pedestrians Buy Sandwiches Sold from ..... 580
Automobile, Pictures Painted by Artist on.. 200
Automobile Plunges onto Deck of Fire Tug 884
Automobile Power Sprayer, Tree Pests Eliminated by ..... 565
Automobile Radiator Cap Attachments, Lock for ..... 438
Automobile Radiator Cap, Vapor Condensed by ..... 728
Automobile Radiator, Clamp for Workbench Holds ..... 597
Automobile Radiator, Quick Repair for..... 292
Automobile Radiator, Preventing Freezing of ..... 927
Automobile Radiators, Repaired, Testing... 134
Automobile Rear Axles, Portable Bench to Hold ..... 457
Automobile Repair Shop Hoist, Pipes and Fittings Used to Make..... 781
Automobile, Road Making Machine Made of 709
Automobile, Roadside Camping Outfit for... 712
Automobile Running Board Baggage Rack, Folding ..... 754
Automobile, Running Board Basket for Dog 787
Automobile Searchlight, Road Mirror, and Flag Holder in One..... 755
Automobile Service between National Parks 264
Automobile, 7-Room Tent Carried on Running Board of..... 269
Automobile, Snow and Ice, Egg Shaped Runners for..... 1
Automobile, Somersaulting, Creek Receives. 176
Automobile Spare Tire Carriers..... 706
Automobile Spark Plug Wires, String Used to Identify ..... 778
Automobile Spark Plugs, Trough for Rain Prevents Grounding of..... 293
Automobile Speeders, Morgue Trip Sentence of ..... 523
Automobile, Speedy, Airplane Parts Used to Make ..... 48
Automobile Speedsters, Seats from Chairs for ..... 953
Automobile Spring, Tool Made of..... 610
Automobile Springs, Truck Bumpers Made of 142
Automobile Station, Tire Pressure Gauge on Air Compressor at..... 616
Automobile Steering Gear, French Bicycle Operated with ..... 681
Automobile Steering Wheel, Table Lamp Made from ..... 785
Automobile Steering Wheel, Top Cut Off of. 619
Automobile, Step Carried in..... 157
Automobile, Streamline, Hood Camouflages 170
Automobile Street Sprinkler, Tank Carried on Trailer of..... 566
Automobile, Telescopic, Family Accommodated in ..... 168
Automobile, Three Wheeled, for Children... 342
Automobile Thresher Goes from Shock to Shock ..... 553
Automobile Tire Boot, Hooks Fasten Around Inner Tube ..... 829

Automobile Tire Casing Form, Collapsible, Four Sections in ..... 759
Automobile Tire Chains, Telescopic Carrier for ..... 919
Automobile Tire Last for Garages..... 756
Automobile Tire Repairs, Clamp for Searchlight Aids in..... 287
Automobile Tire Repairs, Emergency Light for ..... 611
Automobile Tire Salesmanship, Traveling Experts Teach ..... 740
Automobile Tire Spreader and Pressure Gauge ..... 926
Automobile Tire, Trunk Strap Repairs Hole in ..... 473
Automobile Tire Valve, Wire Holds Open... 127
Automobile Tire, Wire Used to Repair Blowout in ..... 775
Automobile Tires, Air Compressor for..... 427
Automobile Tires, Hole in Rim Aids in Removal of ..... 139
Automobile Tires, Old, Rubber Gaskets Made from ..... 791
Automobile Tires, Rubber Cement Used to Mend ..... 157
omobile Tires, Tool for Spreading..... 64
omobile, Tonneau Locker for..... 594
utomobile Tops, Dressing for..... 136
Automobile Tops, Prolonging Life of..... 447
Automobile Traffic, Heavy, Lincoln Highway Has ..... 747
Automobile Trailer Bungalow ..... 320
Automobile Trailer Bus, 80 Passengers Carried by ..... 747
Automobile Triple Gear Rivets, Anvil for.. 312
Automobile Truck Chassis, Home Built on.. 833
Automobile Truck Dump Body Hoist, Worm Gear does Duty as Brake in..... 273
Automobile Truck, Front and Rear Wheels Steer ..... 571
Automobile Truck Is Hotel on Wheels.... 356
Automobile Truck, Metal Tread on Paper Tires of ..... 598
Automobile Truck Train, 15 Tons Carried by 269
Automobile Trucks, Mud Hook for..... 297
Automobile, Unmanageable, Bridge Wrecked by ..... 713
Automobile, Used, How to Test..... 618
Automobile Vacuum Tanks, Funnel for Filling Made from Oilcan..... 769
Automobile Valve Springs, Spring Washers Made of ..... 450
Automobile, Warning Given by Alarm Bell on ..... 676
Automobile Washing Establishment..... 759
Automobile Wheel, Left Front, Guard for.. 782
Automobile Wheel, Pneumatic, Tire on Hub of ..... 330
Automobile Wheels, Rear, Cleated Plates for 922
Automobile—Windshield, Double, Open Vision Slit Provided by..... 864
Automobile Windshield Eye Protector..... 712
Automobile Windshield Screen, Insects Kept Out by ..... 886
Automobile, Wings Transform into Aeroplane ..... 349
Automobile Wire Wheel Nipple Tap, Old Spoke Used to Make..... 796
Automobiles, American, Egypt Sends Requests for ..... 48
Automobiles, Cheap, City Mechanics Make. 894
Automobiles, Crossing Right to..... 895
Automobiles, Electric, Battery Charging Stations for ..... 40
Automobiles, Flexible Steel Spouts for Oilcans and Grease Guns Used on..... 749
Automobiles, Future, to be Very Light..... 484
Automobiles—Hub Odometer, New Driving Method Used for..... 204
Automobiles in Tiers, Garage Built of Elevators Stores ..... 567
Automobiles, Laundries for ..... 228
Automobiles, Light, in England..... 836
Automobiles, Magneto Neutralized to Prevent Use if Seized by Enemy..... 122
Automobiles, Red Lights Guide to Main Road for ..... 910
Automobiles Side by Side, Locomotive Hit by ..... 392
Automobiles, Thumb Prints of Owner as Identification of ..... 516
Automobiles, Wireless Equipment for..... 523
Automobiles, Wooden Streets Worn by.... 750
Automobilists, Signs on Trunk Highways in Wisconsin Aid to ..... 52
Aviatrix, Baroness de la Roche, Woman's Altitude Record Goes to..... 187
Axles, Rear, of Auto, Removing Grease from 605

Babbitt, Blowholes in, Prevented by Rosin.. 797
Babbitt Metal Stove, Gas, Swinging Support for ..... 771
Babies, German, Machine Sterilizes Milk Bottles for ..... 846
Baby, Airplane Ride Taken by..... 601
Baby, Attachment on Parents' Bicycle for Carrying ..... 164
Baby in High Chair, Belt Secures..... 595
Baby Perambulator, Screened..... 311
Backgrounds, Painted, Railroad Signals Improved with ..... 259
Bag, Hand, Flap Protects Contents of..... 274
Baggage Rack, Automobile Running Board. 754
Bait for Raccoon Trap, Mirror Used as.... 319
Balance Scale, Level Base Not Necessary for Working of ..... 6
Balanced Rock, Base Concreted to Save.... 198
Baling Machine, Barbed Wire Salvaged with 335
Ballast for Tractor, Hollow Wheels Carry.. 586
Ballonets, Airship's Fabric Lifeboats Inflated from ..... 665
Balloon Blown Helplessly About North Atlantic ..... 370
Balloon Companies, Coast Artillery at Panama Canal to be Assisted by..... 335
Balloon, Free, Floats over New York City.. 912
Balloon, Houses Shaken by Explosion of.... 426
Balloon Parade in Army Air Circus..... 103
Balloon System, Electric Trolley, Man Proposes ..... 239
Balloon, Toy, Hydrogen Used to Inflate.... 465
Balloons, Gas Tanks Used by Faker to Inflate ..... 853
Balloons, Performances Test..... 214
Balloons, Ruins of Buildings House..... 93
Balloons, Small, Air Currents Studied by Army with ..... 88
Balloons, Valve Maintains Uniform Pressure in ..... 810
Balls in Spark Plug, Carbon Kept away by. 49
Bamboo Caldrons, Chinese Salt Manufacturers Use ..... 860
Bamboo Grove, Experimental, Planted in Georgia ..... 845
Bamboo Logs Serve as Buckets in Hawaiian Islands ..... 760
Banana Oil, Nickel Polish Preserved by..... 465
Bandage, Inner Tube Used over ..... 955
Band Concerts, Noon Hour, for Shipyard Workers ..... 367
Band Saw, Portable, Electric Motor Drives. 727
Bandit Raisuli, Photographs of His Battle Scenes Taken by ..... 690
Bank Accounts Established to Pay Employes ..... 216
Bank, Armor Plated City, Truck Used to Deliver Money for..... 223
Bank Building Roof, Blazing Dirigible Crashes Through ..... 357
Bank Desk, Labor and Floor Space Saved by 352
Bank Guard, Loopholed Turret Used by.... 497
Bank, Indexed Case for Checks and Deposit Slips for ..... 541
Bank Protection, Kinks in..... 613
Bank Vault, Dynamite Blasts Remove..... 244
Banks, Children's, Conducted on Conventional Lines ..... 879
Banks, Federal Loan, Home Builders to be Helped by ..... 236
Banks, Hand Grenade, War Department to Give ..... 235
Baobab Tree, Fiber of, Used for Paper..... 203
Barbed Wire, Baling Machine Salvages.... 335
Barbed Wire, Nature's, Fences in Southwest Made of ..... 92
Barbed Wire on Battle Fields, Salvage Committee to Reclaim..... 84
Barges, Atlantic Coast, Quincy, Ill., Builds.. 75
Barium, Paint Pigments Made from Selenites of ..... 426
Bark Wounds in Trees, Care of..... 283


Digitized by Google

Barn for Dairy, Round, Chores Quickly Done in ..... 544
Barn, Hay, Mechanical Fork for ..... 293
Barn, Tractor Aids Farmer in Building .... 552
Barrack for Naval Airmen Equipped like Club ..... 727
Barrel Blanks, Galvanized Iron, Machine Corrugates ..... 62
Barrel, Oil Forced from by Air Pressure .... 779
Barrel, Sturdy, Strip of Gummed Paper Makes ..... 384
Barrel, Water, Wash Tubs Made of ..... 450
Barrel, Wheelbarrow Roller Made of ..... 930
Barrels, Dry, Wet Straw Packed in as Means of Swelling ..... 145
Barrels, Empty, Stranded Steamer Floated with Aid of ..... 330
Baseball—Big League Catcher, Secret Finger Code Revealed by ..... 193
Basement, Motor Driven Blower in, Air Cooled in Office or Home by ..... 144
Basket, Fire, Caterpillars Killed with ..... 151
Basket for Flowers, Irrigating Can for ..... 386
Basket, Hanging, Horse Muzzle Used for .... 295
Basket of Cow's Udder, Indians of Chile Make ..... 261
Basket Weaving, Sanitarium Tubercular Patients Make ..... 736
Basket, Wire, on Running Board for Dog .. 787
Bat Roost, Mosquitoes and Malaria Eliminated by ..... 392
Bath, Shower, for Mine Mules ..... 14
Bather, Back Somersaults in Surf by ..... 467
Bathers, Submersible Water Bicycle for .... 30
Bathing Beach Life Preservers, Torpedo Shape for ..... 64
Bathing Suit, Inflatable, Wearer Not Hampered by ..... 710
Bathroom Cabinet, Three Mirrors on ..... 783
Bathroom, Shower Bath Stall Built in ..... 405
Bathroom, Sponge and Soap Holder for ..... 914
Bathtub Fixture, Supply and Overflow Combined in ..... 753
Battery, German, in Belgium, Interesting Points of ..... 690
Batteries, Flashlight, Outfit Makes When Needed ..... 191
Batteries in Telephone Circuits, Rochelle Salt Crystals Replace ..... 184
Battery Charging Stations for Touring Electric Autos ..... 40
Battle Fields, Barbed Wire to be Reclaimed from ..... 84
Battle Map, Pershing's, National Museum Displays ..... 45
Battleship Cake, Western Chef Molds ..... 893
Battleship, Dry Land, Naval Electricians Trained on ..... 829
Battleship, "New Mexico," Driven by Electric Motors ..... 646
Battleship Propeller Shaft Bearings, Lignum-Vitæ Used to Make ..... 662
Battleship, "Tennessee" Is America's Largest ..... 84
Battleship, Wooden, Tank Made of ..... 440
Beach Chair, Folding, Pneumatic Cushion on 914
Beach, Ocean, Old-Fashioned Stiles Give Access to ..... 37
Beach, Samuel W., Sends Wireless Messages by Machine ..... 845
Beach Schoolhouse in California ..... 120
Beach, Wet, Danger to Motorcycles on .... 896
Beads, Sea Shell, Unearthed in Mound Builders' Tomb ..... 688
Beams and Jack, Heavy Duty Press Made with ..... 772
Bean Harvesting Attachment for Tractor .. 62
Bean, Prehistoric, from Cliff Dwelling Sprouts ..... 74
Bear Cub Is Automobile Mascot ..... 600
Bearings, Roller Arrangement Gives Strength to ..... 579
Bed, Outdoor, and Garden Seat, Spring Couch Used for ..... 447
Beds, Metal, Gates Made with ..... 145
Beef, Fresh, Central Ice Plant Supplies to A. E. F. ..... 71
Beer Keg Phonograph, Window Display Features ..... 325
Bees, Flower Laden Aeroplane Followed by. 509
Bees, Queen, Canadian Develops System for Raising ..... 648
Bees' Stingers, Profitable Crop from, by Sam E. Conner ..... 355
Beet Growers, Nets Used in Unloading Crops of ..... 196
Beet Harvester, Motor Digs, Tops, and Loads ..... 871
Beet Sugar By-Products, Beef Cattle Fatted on ..... 413
Beet Sugar, U. S. Second Among Producers of ..... 896
Bell, Dinner, Steel Plow Share Used as .... 462
Bell, Electric Burglar Alarm Rings When Wires are Cut ..... 157
Bell, Electric, Cigar Box Used to Make Sounding Board for ..... 792
Bell, Electric, Hospital Use for ..... 784
Bell, Single Stroke, Rings of Are Continuous ..... 609
Bell, Static Electricity Charges Ring ..... 316
Bells of Westminster Abbey, Peace to be Welcomed by ..... 194
Belt, Baby Secured in Chair with ..... 595
Belt, Braided Leather, Instructions for Making ..... 795
Belt for Machine, Collapsed Fire Hose Used as ..... 284
Belt, Rope Used for Placing on Pulley .... 775
Belt, Sandpaper Used to Put on Pulley ..... 791
Belt Shifter Acts at Two Points ..... 726
Belt, Tight, Sandpaper Used to Put on ..... 793
Belts, Machine, Kitchen Scouring Powder Used to Clean Grease from ..... 155
Bench and Tool Locker Combined ..... 134
Bench, Park, Concrete and Steel Makes Immovable ..... 756
Bench, Portable, Auto Rear Axles Held by . 457
Benzine, Miners' Safety Lamp Burns ..... 762
Beryllium, Paint Pigments Made from ..... 426
Bevel Protractor, T-Square Has ..... 797
Bible, Moving Pictures to Film ..... 821
Bicycle Attachment, Baby Rides with Parents in ..... 164
Bicycle, Biplane Driven by ..... 601
Bicycle, French, Steered like Auto ..... 681
Bicycle Handlebar Grips, Garden Hose Used to Make ..... 631
Bicycle Power Wheel, Alaskan Motorizes Sled with ..... 879
Bicycle Racks for Shops ..... 766
Bicycle, Stand of Wood Attached to ..... 30
Bicycle Tires, Leather Strips Protect ..... 78
Bicycle, Trailer Cart for ..... 147
Bicycle, Water, for Bathers ..... 3
Bicycle Wheel, Tool Rack Made from ..... 77
Bicycle with Broken Chain for One-Legged Riders ..... 37
Bicycles, Sailors Cross Continent Handcuffed to ..... 25
Billboard Map, Motorists Aided by ..... 38
Bill File, Mousetrap Used as ..... 45
Billing Machine or Typewriter, Adjusting Tabulator on ..... 95
Bin for Poultry Feed, Waste Prevented by. 63
Binder, Corn Shock ..... 76
Biographies, Wheat, Experts Write ..... 9
Biology—Memorial to Roosevelt, Forest Biological Station to be ..... 25
Biology—Protoplasm, Two Uncombining Substances Found in ..... 5
Biplane Is Descendant of Cross Channel Bus 82
Biplane, Low Priced, to Appear on Market. 25
Biplane, Premier Lloyd George's, Alterations Increase Speed of ..... 6
Biplane, Small, Built at Cost of Motorcycle .. 9
Biplane, Velocipede Drives ..... 60
Bird Cages in Pergola Entrance ..... 11
Birds, Improved Traveling Cage for ..... 43
Birds—Parrot and Cockatoo Industry, by J. E. Hogg ..... 70
Birds, Pictures of Stuffed, Curved Background for ..... 5
Birds, Stuffed, Packing Box for ..... 1
Birthday Party of Lion, Children Attend .... 2
Bit, Auger, Holes Smoothed by ..... 5
Bit Brace for Overhead Work, Chip Catcher on ..... 1
Bit, Expansion, Washer Cutter Made of .... 7
Bit, Round, Square Hole Bored by ..... 7
Bits, Auger, Removable Parting Lip for .... 2


Digitized by Google

Blackboard, Nursery Table Tray Conceals.. 920
Blasting—Drill Hole, Electric Light Globe Boils Water Out of..... 436
Blind Man, Direction Indicator Invented by 15
Blind of Great Britain, Geographic and Industrial Atlas for..... 263
Blind Rope Workers, Skill Diplayed by.... 585
Block Puzzle, Dovetailed..... 467
Blocks, Jumping, Paddle Used to Move..... 69
Blocks on Feet, Shoe Leather Saved by.... 885
Blocks, Toy, Cement Used to Make..... 954
Blood Transfusion Operations, Persons Examined for ..... 162
Blotter, Desk, Fitted to Chair and Used as Desk ..... 622
Blotting Paper and Chloroform, Paint on Clothes Removed with ..... 127
Blower, Motor Driven, Air Cooled in Office or Home by..... 144
Blowholes in Babbitt, Rosin Prevents..... 797
Blueprint Tracing, Dilute Red Ink with Water for ..... 628
Blueprint Tracing, To Provide Duplicate of. 611
Blueprints, Borrowed, File Clerk Uses Wooden Pins to Locate..... 776
Blueprints, Creased, Retracing of..... 453
Blueprints—Drawing on Glass with Ink.... 299
Boardwalk, Breakers' Force Lessened by Holes in ..... 260
Boars, Wild, Camera Catches..... 837
Boat, Aquarium Collecting, Specimen Well in ..... 741
Boat—Bridge, Ship Damages..... 119
Boat, Curious, Engine from Auto Drives.... 541
Boat, Dredges, Common Jacks Raise..... 267
Boat—Dugouts, Primitive Colombian Shipyards Produce ..... 745
Boat Engines, Dirt Trap for Gasoline Line in ..... 295
Boat, False Sides Form Life-Saving Rafts.. 39
Boat—Fire Tug, Engineer's Salary Saved by Shortening ..... 37
Boat, Freight Containers for..... 574
Boat, Gasoline, Engine Back Fire Causes Explosion of ..... 858
Boat, Hollow Fin Contains Motor and Propellers ..... 714
Boat Hull, Wood and Steeel Combined in.... 904
Boat, Plaster Used to Make..... 426
Boat Rafts, Gas Tanks Towed Upstream on. 70
Boat, Rudder Turns, Stops, Reverses..... 261
Boat, Torpedo, Halibut Trawler Made of.... 376
Boat, Trolley Transports..... 479
Boat, Wheeling to Water..... 625
Boat, Woman Pilots on Mississippi River.... 56
Boats, Air Propelled, Missouri River to be Navigated by ..... 385
Boats, Combined, Pail and Funnel for..... 313
Boats, Current Propeller for..... 629
Boats, Deflated, Carried in Hand..... 642
Boats, Fishing, Anchors Operated by Pulleys on ..... 313
Boats, Glass Bottom, Advertisement on Ocean Bed Seen through..... 593
Boats, Seamless Metal, Cost Less Than Wood ..... 534
Boats, Small, Explorers Brave Arctic Storm in ..... 855
Boats, Trial of Air Propellers for..... 401
Boats with Crane Equipment, Shark Hunters Use ..... 675
Body Dimensions, Measuring Done with.... 952
Body, Human, Effluence from..... 68
Boiler Corrosion, Coke Fuel Causes..... 836
Boiler Flues, Short, Fitting of..... 456
Boiler, Fruit Bottle Tray Supported by Bottom of ..... 275
Boiler, New Type, Electricity Heats Water in ..... 392
Boiler, Steam Engine, Solar Heat Generates Steam in ..... 795
Boilers, Perforated, Metal Water Gauge for 94
Bolshevists' Theater Pay Roll Plan Fails.... 413
Bolster for Hospital, Canvas Strips Attached to Head of Bed Support..... 70
Bolt Heads, Socket to Hold..... 139
Bolt, Left-Hand Thread on, Made with Right-Hand Tap ..... 773
Bolt, Long, for Hinge, Gate Held Securely by 612
Bolt, Ring for Canoe, Ring and Cotter Pin Used to Make ..... 310
Bolt, Screwdriver Used to Hold..... 457
Bolt, Slotted, Poultry Netting Staples Held by ..... 141
Bolt, Wood Joint Strengthened by Corrugated Washer on ..... 759
Bolts, Broken Off, Tool Removes..... 284
Bombs in Mail, Anarchist Plot Foiled by Seizure of ..... 55
Bombs, Police to X-Ray..... 552
Bones, Fossil Seal, Tractors go to Pribilof Islands to Haul..... 70
Book, Case for Jewels Shaped like..... 434
Book of Homer, Germans Print Propaganda in Greek in..... 364
Book Supports, Brick Used to Make..... 459
Bookbinding, Sanitarium Teaches Tubercular Patients ..... 736
Bookcase and Desk, Combination..... 915
Bookholder, Adjustable, Clamps on..... 594
Bookkeeping Machine, Convenient Tray Speeds Up ..... 78
Books in Hospital, Gocart Delivers ..... 196
Books, Vocational Training, for Ex-Soldiers. 752
Bookshelf, Hanging ..... 476
Boom, Timber, at New Orleans..... 541
Boot, Automobile, Blowouts Prevented by... 829
Bootjack, Adjustable, Strap Used to Make.. 276
Border, Mexican, Mobile Laundries Ordered to ..... 726
Borer, Corn, Liquid Fire and Steam Used to Kill ..... 585
Boring Mill, Chips in Slots of..... 621
Boring Tool for Deep Holes in Wood..... 300
Botanical Garden in Versailles, Plan Proposed for ..... 578
Bottle Cap's Crown, Tool for Crimping..... 435
Bottle Corks, Loop of Cord Aids in Pulling. 436
Bottle, Hot Water, Holder for..... 631
Bottle Opener, Key Blank Used to Make.... 634
Bottle Opener, Milk, Wire Bent to Form..... 286
Bottle, Putting an Egg in..... 956
Bottle Tray, Fruit, Boiler Bottom Supports.. 275
Bottle, Vacuum, Steel Used to Make..... 755
Bottles, Hinged Rack for..... 609
Bottles, Milk, Machine Sterilizes for German Babies ..... 846
Boulevard, Temporary Wood Incline Links. 890
Bowlder Memorial to Newspaper..... 751
Box, Cigar, Electric Bell Sounding Board Made of ..... 792
Box for Flowers Built on Chimney..... 632
Box for Rat Poison, Poultry Protected by.. 622
Box in Fence, Garbage Can Chained to..... 152
Box, Motorcycle Garage Made of..... 455
Box, Packing, for Stuffed Birds..... 191
Boxes, Packing, Fire Hydrants for Use in Riots Concealed by..... 99
Boxing Match, Aerial, Army Officers to Hold 438
Boy, Aeroplanes and Racing Car Built by... 121
Boy Scout, Medal as Tombstone for..... 121
Boy Scouts' Motor Hike, Moving Pictures of. 190
Boy Scouts of America, Campaign for Associate Members by..... 43
Boy Sea Scouts, England Birthplace of..... 601
Boy, Seal in Delaware Bay Found by..... 281
Boycott of German Goods, Door Mat Advocates ..... 681
Boys, Miniature Aeroplanes Made by..... 280
Boys of New York, Military Training for... 829
Brace of Wire for Worn Broom..... 615
Braces, Clapboard Covered Shed Braced Externally with ..... 656
Bracelet, Rosary in Relief on..... 435
Bracket for Draftsman's Lamp..... 941
Bracket Seat for Roof Folds for Shipment... 599
Brain Congestion, Stammering Caused by... 256
Brass and Iron, Valve Grinding Compound Used to Polish..... 770
Brass and Leather Cementing, Hot Flatiron Used for ..... 766
Brass or Copper Tubing, Splicing with Wire 799
Bread Dough, Sea Water Used to Mix..... 567
Bread Toaster for Use on Gas Stove..... 755
Breakfast Table, Outdoor, Two Hundred Eat at ..... 505
Breeches, Knee, and Stocks, Men's Tailors Would Revive ..... 918
Breweries, Wheat Substitute Is Yeast Made in ..... 277
Brewery, Mushrooms Supplant Beer in..... 580


Digitized by Google

Brick, Fire Resisting, Sawdust Used to Make ..... 238
Brick, Self-Binding, Are Interlocking..... 408
Bricks, Book Supports Make from..... 459
Bricks, Building Campaign Dinner Announced by ..... 901
Bricks, Slate Waste of North Wales to be Made into ..... 668
Bridge Arch, Silo Blocks of Concrete Used for ..... 52
Bridge, Automobile Wrecks..... 713
Bridge Building, Concrete, Portable Arches Simplify ..... 753
Bridge, Concrete, in Oregon, Remarkable Span for ..... 650
Bridge, Concrete, in Sweden One of World's Largest ..... 728
Bridge, Concrete, Lightning Damages..... 555
Bridge, Concrete, Longest Arch Claimed by. 863
Bridge, Concrete, over Mohawk River, Plan for ..... 506
Bridge, County, Dead Soldier Memorialized by ..... 193
Bridge of Rough Stone for Chicago Suburb.. 588
Bridge, Pontoon, American Soldiers Build across Rhine ..... 716
Bridge Rail, Automobile Smashes..... 237
Bridge Rules in Rime, by Charles H. Wright 800
Bridge, Ship Damages..... 119
Bridge, Steel, Removed and Saved..... 740
Bridges, Army Trucks on Western Highway Break ..... 690
Bridges, Concrete, Dead Soldiers' Names Given to ..... 68
Bridges, Simple, for the Farm..... 446
Bridges, Surface of Oil Treated Clay for.... 774
Brine, Eggs Tested in..... 159
Bristles of Hogs, Brushes Made of..... 631
Broiler and Griddle Combined..... 754
Broiler, Heated Gases Pass Through Hollow Tubes of ..... 595
Bronsdon, E. T.:
A Wood that Is Stronger than Steel..... 419
On the Trail of the "Hard Stuff"..... 343
Smokeless Powder from Tree Stumps War Development ..... 549
The Small Store Moves to State Street.... 173
Broom Corn, Thresher for..... 94
Broom Handle, Magnets in, Pick Up Tacks.. 155
Broom Holder, Bent Wire..... 953
Broom, Worn, Wire Brace for..... 615
Brooms, Date Palm Leaves Used to Make... 434
Brush, Fountain, Many Uses for..... 595
Brush, Nail, for One-Armed Person, Rubber Suction Cups on Back of..... 275
Brush, Steel, Rifle Cleaned by Shooting..... 598
Brush, Varnish, Cycle Chain Kept Clean with 156
Brush, Wire, Potatoes Peeled with..... 462
Brushes, Paint, Waxed Paper Keeps Soft... 767
Bucket, Compartment, for Fire Smothering Liquids ..... 434
Bucket, Fire, Sign Prevents Misuse of..... 931
Buckets, Bamboo Logs Serve Instead of in Hawaiian Islands ..... 760
Buckets on Fire Hydrants for Horses..... 91
Buffalo Calf, Canadian Shriners Take to Buffalo ..... 120
Buffing Machine for Print Shops..... 537
Buggy Seat, Stump Supports..... 465
Buggy Wheel, Mail Boxes on..... 611
Bugle, Army, Electric Siren Replaces..... 50
Builders, Home, Federal Loan Banks Planned to Help ..... 236
Building—American Housing Methods for Rebuilding France..... 332
Building—Ancient Tower Made to Order for American ..... 77
Building—Apartment Turntable Provides Four Room Conveniences..... 338
Building—Automatic Sewage Pumping Station ..... 400
Building—Barn, Tractor Aids Farmer in Building ..... 552
Building—Bungalow for a Small Lot and a Slim Purse ..... 160
Building Campaign Dinner, Bricks Announce 901
Building—Concrete Arch, Mammoth, Costly Theater Has ..... 408
Building—Concrete Poured into Walls through Spouts ..... 240
Building, Electric Drums Move..... 879
Building, Factory, Four Wings on..... 906
Building—Farmstead, Engineering Plan Used to Lay Out..... 480
Building—Floor Added to Building When Roof is Raised..... 415
Building—Floors, Reinforced Concrete Units for ..... 118
Building for Fire Sale, Record Construction of ..... 839
Building, Grease Gun Used to Apply Cement to ..... 775
Building Homes, Discount Offered on Material to Encourage..... 95
Building—Hotel for Chateau-Thierry New Mecca of Tourists..... 78
Building, Memorial, Illinois Plans..... 649
Building Memorial to James Watt, Scientists Plan ..... 590
Building, Metal Sheathing for..... 858
Building—Model Tenements to Replace Congested Slums ..... 58
Building, Money to be Advanced to Encourage ..... 192
Building—New Assay Office Vaults Largest in World ..... 364
Building, New, Zinc Used in Construction of 39
Building—Rebuilding of Sinking Armory... 517
Building—Revolving Garden Shelter Placed on Market ..... 370
Building Roof, Glass Walled Theater on.... 522
Building Site, Aeroplane Helps Architects Select ..... 69
Building—Summer House, Rustic..... 639
Building—Theater Nursery Enables Mothers to See Show..... 60
Buildings, Cinder Concrete Used to Construct 834
Buildings Destroyed to Widen River Bed... 725
Buildings, Flat, Collective Ownership of.... 506
Buildings in Devastated Districts of France, Minister Reports Condition of..... 230
Buildings—Linoleum, Henhouses Weatherproofed with ..... 779
Buildings, Memorial, for World War Veterans ..... 713
Buildings, Ruins of, Balloons Nest in..... 93
Bulb, Flashlight, for Mending Gloves..... 153
Bulb, Hyacinth, Two Color..... 476
Bulbs, Native, Imported Products Displaced by, by R. P. Crawford..... 572
Bulbs of Hyacinths, Producing..... 611
Bulls, Fence Protected from..... 140
Bumper, Tubular, Auto Lock and Alarm Concealed in ..... 393
Bumpers, Truck, Auto Springs Used to Make 142
Bungalow for Neighborhood House, Women Raise Funds to Build..... 588
Bungalow for Small Lot and Slim Purse..... 160
Bungalow in Heart of City, Housing Movement Aided by..... 206
Bungalow, Luxurious, Auto Trailer Is..... 329
Bungalow, Portable, Farm Lighting Outfit Carried in ..... 246
Bunkers, Excavating Contractors Use to Keep Shovels Working..... 735
Bureau of Resort Information, Sporting Goods Store Has..... 823
Burglar Alarm, Electric, Rings Bell When Wires are Cut..... 157
Burglar, Key Attachment Frustrates..... 594
Burlap, Poultry House Nests and Roosts Protected with ..... 140
Burners, Oil, Frozen Coal in Cars Thawed by 532
Burrowing Machine, Cable Put under Sunken Ship by ..... 658
Bus, Auto, for Alaska Trails..... 371
Bus Conductors, Filipino Girls Success as... 197
Bus, Cross Channel, Biplane Is Descendant of ..... 821
Bus, Glass Top, Sight-Seers Have All Around View from..... 80
Bus, Motor, Wireless Receiving Antenna on 340
Bus, Trailer, 80 Passengers Carried by..... 747
Bushing, Rubber Hose, for Wooden Plug... 294
Bushings, Removing Play in ..... 938
Business Men—Aeroplane Cabin Designed as Office for ..... 886
Busses, Aerial, Western Cañons Viewed from 37
Busses, New York, Cover for Upper Decks of 904
Butchers' Steel, File Used to Make..... 708
Butt Hinge as Window Stop..... 937
Butterfly Farm, France Starts..... 883


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Butterfly Net, Folding Frame for..... 314
Buttermilk, Chickens Fattened on..... 538
Button, Snap, of Glove, Repairing..... 145
Buttonwood Tree Base as Well Curb..... 199
Buttresses, Old Adobe Church Walls Propped by ..... 692

Cab for Baby, Fresh Air, Screen Incloses.... 311
Cabinet, Bathroom, Three Mirrors on..... 783
Cabinet, Electric Lock for..... 794
Cabinet, Historic, Veteran of Civil War Builds ..... 89
Cabinet, Music Roll, Pocket Knife Used to Carve ..... 748
Cabinet, Phonograph Record, Sofa Arm Conceals ..... 754
Cabinet, Shelf, Spools Used to Make..... 630
Cabinets, Kitchen, Packing Cases for Europe Become ..... 375
Cable, British-Canadian, Was Once German-American ..... 648
Cable Code in Nine Languages, Trade to be Encouraged by ..... 356
Cable, Electric, Unusual One-Piece Lengths. 48
Cable, New, North and South America to be Connected by ..... 196
Cable, Submarine, Planned for Pacific Ocean 540
Cabs, Horse Drawn, Compete with Automobiles in Nation's Capital..... 744
Caddies' Golf Ball Trade, Sign Stops..... 372
Café, French, Misspelled Sign Increases Trade of ..... 710
Cafeteria, Pigs Select Own Food at..... 202
Caffeine, American Holly Contains..... 917
Cage, Shipping, Birds Travel Comfortably in 430
Cakes, Extraordinary, Western Chef Molds. 893
Calcium Carbide, Alcohol Made from..... 536
Calculating Machine, Table Made into Desk for ..... 300
Calculator, Anti-Aircraft Fire Control Simplified by ..... 912
Caldrons, Queer, Chinese Salt Manufacturers Use ..... 860
Calendar, Apprenticeships Estimated by.... 780
Calendar, Wall, Permanent Diary Kept on.. 436
Calipers, Hermaphrodite, Shoulder on..... 610
Calipers, Inside, Legs Turned Same Way on 140
Camel Caravans, Chinese, Trucks Displace.. 423
"Camels," Collapsible, Sunken Ships Raised with ..... 171
Camels, Demobilizing of, by G. F. Paul..... 545
Camels, Men on Influenza Patrol Supplied with Food by..... 265
Camera, Hand, Focus with Full Size Image in ..... 485
Camera, Hand, New Finder for..... 648
Camera, Human Deformities Studied with, by Robert H. Moulton..... 361
Camera, Map Making, for Aeroplanes..... 726
Camera, Miniature ..... 143
Camera, Ordinary, Panorama Pictures Taken with ..... 293
Camera, Photograph Copied without..... 785
Camera Plates, Method for Opening Box of. 793
Camera, Repeating, Takes no "Doubles" or "Blanks" ..... 833
Camera Tripod, Music Rack Used for..... 319
Camoufleur, German, Cheesecloth Tank Built by ..... 367
Camp Refrigerator, Spring Water Used in.. 465
Camp Stove, Folding..... 634
Campaign for 1920, Presidential, Phonographs to be Used in..... 497
Campers, Auto Body as Trailer for..... 879
Campers, Auto, Roadside Outfit for..... 712
Campers, Automobile Body Hides Outfit for. 195
Campers, Automobile with Beds, Lavatory, and Kitchen for..... 15
Campers' Dutch Oven, Directions for Making 786
Campers, Summer, Tent of Pine Needles or Grass Made for..... 315
Camping, Hints for Beginners in..... 304
Campus, University, on Lake Shore..... 804
Can for Oil, Flexible Spout on..... 933
Can Opener, Crank Operates..... 275
Can Opener, Easy Operating..... 799
Can Opener, Stovepipe Cut with..... 785
Can, Tin, Snow Shoes Made from..... 950
Can, Tin, Sweet Clover Seed Gathered with 792
Can, Tin, with Open End, Float for Toilet Tank Made of..... 302
Canal, Concrete, Curious Method Used to Enlarge ..... 908
Canal in Louisiana, Dynamite Completes... 596
Canal, Panama, Air Defenses Planned by Army for ..... 335
Canal, Panama, Dry Docks for..... 711
Canal, Panama, Flying Boat Hits Lock of.. 58
Canal, Panama, Hydroelectric Plant Doubles Output at ..... 432
Canal, Panama, Shipworms, Found in..... 868
Canal, Serbian, Danube and Ægean Sea to be Connected by ..... 270
Canal, Ship, Finland Plans..... 671
Canal, Ship, in New Orleans, Harbor Facilities Offered by..... 490
Canal, Suez, Harbor Development for..... 696
Canal under Jerusalem, Holy Land to be Irrigated by ..... 823
Canal Zone, Panama, Marine Forest Fires in 699
Cancer, Dye Laboratory is Hope for Amelioration of ..... 863
Candle, Clock Operated by..... 142
Candle Flame is Ventilation Guide..... 696
Candle Smoke, Imitation Marble Finish Produced by ..... 314
Candle Wax, Flowers Made of..... 631
Candlesticks, Metal, Tapers on Christmas Trees Replaced by..... 598
Canneries, Salmon, Built on Scows..... 548
Canning Clubs, Arkansas, Men's Interest Aroused by ..... 191
Canning, Community, Completely Equipped Kitchen for ..... 589
Canning—Fruit Bottle Tray, Boiler Bottom Supports ..... 275
Canning—Mason Jars, Tongs for Handling in Hot Water..... 275
Canoe, How to Manage..... 530
Canoe, Power Plant for ..... 303
Canoe Ring Bolt, Cotter Pin and Ring Used to Make ..... 310
Canoeist, Marathon, Daring Trip Made by, by L. W. Pedrose ..... 661
Canoes, Primitive Colombian Shipyards Produce ..... 745
Cañon, Western, Concrete Benches and Tables Built in..... 911
Cañons, Western, Aerial Sight-Seeing Busses Fly Over ..... 37
Canopy, Metal, Window Protected from Rain by ..... 638
Cans, Tobacco, Hinges Made from..... 633
Canteen, Honor System, Test for Students is 424
Canteen, Water Kept Cold in..... 473
Canvas Backstop for Golf Practice..... 652
Canvas Floats, Army Footbridge Supported by ..... 93
Canvas, Government Tests of Prove Dependable ..... 352
Canvas Layers for Aeroplane Propellers, Carbolic Acid and Formaldehyde Bind.... 868
Capitol, Wisconsin, Electric Welcoming Sign on Dome of..... 751
Car, Adjustable, for Child..... 441
Car Body, Special, Molten Metal Carried and Poured by ..... 167
Car Fare Tokens, Metal, Street Railways Use ..... 917
Car, Refrigerator, Automatic Cooling System for ..... 909
Car Rides, Length Varies Cost of..... 913
Car Washing Establishment..... 759
Caravans, Chinese, Trucks Displace..... 423
Carbon, Air Nozzle Removes from Cylinders. 779
Carbon, Arc, French Invent..... 524
Carbon Bisulphide Gas, Field Rodents Killed with ..... 771
Carbon, Loose Balls in Spark Plug Keep Away ..... 49
Carbon Monoxide Gas, Absorbent Makes Army Masks Proof Against..... 584
Carbon Monoxide Gas from Factory Chimney, Illness Caused by..... 656
Carbon Monoxide Poisoning, First Aid Treatment for ..... 717
Carbon Tetrachloride, Production of for Fire Extinguishers ..... 726
Carbon Tetrachloride, Tracing Cloth Cleaned with ..... 632
Carborundum Paper, Disked Oilstone Flattened with ..... 149

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Carborundum Wheel, Grease and Dirt Removed from by Sandpaper..... 765
Carburetor, Automobile Run without..... 172
Carburetor, Testing Metal Float of for Leaks 620
Card Index, Police Use for Crimes..... 753
Card Players, Holder for..... 593
Card Playing Rules, Rime Gives ..... 800
Cardboard or Wire, Carpet Corners Stiffened with ..... 618
Cardboard, Screws Held by..... 622
Cards, Playing, Talcum Powder Cleans..... 950
Carnival, Mounted Police Thrill Crowds at.. 500
Carnival, Window Display Uses 15,000 Roses 201
Carpenter, Mirror to Sight Levels Used by.. 453
Carpenter's Gauge, Setscrew Not Required on ..... 764
Carpenter's Saw Clamp, Sticks Used to Make 451
Carpenters' Squares, Distances Measured by 132
Carpet Beater, Weeder Made from..... 473
Carpet Corners, Wiring and Cardboarding.. 618
Carpet on Block, Phonograph Records Cleaned with ..... 806
Carpet Scrubbing Machine like Vacuum Cleaner ..... 873
Carpet Sweeper, Tires for..... 157
Carrier for Messages or Tools for Shop..... 288
Carryall Car, Poor of Harrisburg, Pa., Ride on ..... 911
Cars, Concrete, Tests of..... 196
Cars, Electric Railroad, Small Semaphores Protect ..... 739
Cart, Trailer, for Velocipede..... 147
Cart, Wooden, for Child..... 441
Cartridge Cases, Brass, Government Sells... 656
Cartridge Cloth, Silk, Peace Time Use of.... 386
Cartridge, Fertilizing, Orchard Trees Grow in Soil Broken by..... 282
Cartridge Shells, Paper Held by..... 940
Cartridges, Ammunition Tests Require Many 586
Cartridges, Picture Frames Made of..... 435
Carts for Fuel, Seagoing, Seaplane Station Equipped with ..... 583
Carts, Quarry, High Wheels Make Possible Heavy Loads Carried by..... 330
Carving—Remarkable Violins, Unusual Woods Used to Carve..... 670
Case, Aluminum, Shaving Articles Inclosed in ..... 922
Case, Fiber, for Traveling Dog..... 914
Case, First Aid Kits in..... 935
Case for Tire, Metal, for Automobile..... 510
Case, Indexed, Checks and Deposit Slips Sorted in ..... 541
Case, Tool, Inner Tube Used to Make..... 793
Casein Glue on Aeroplanes, Rats Devour.... 65
Cashier Cage Locks, Device Prevents Picking of ..... 202
Casing, Automobile, Blowout Repaired with Wire ..... 775
Casing Form, Collapsible, Four Sections in.. 759
Casket and Jewel, Mrs. Wilson Receives from People of Paris..... 254
Casseroles, Glazed, Poison may Lurk in.... 203
Casters, Lignum Vitæ Used to Make..... 662
Castings, Metal, Pneumatic Scraping Tool for ..... 734
Castings, Soft, Dipping in Cold Water Removes Sand Scars from..... 465
Castle, Miniature, Carved in Sandstone..... 558
Cat, Rabbit Carried Home by..... 281
Catch for Blacksmiths' Tongs..... 774
Catch, Safety, for Window..... 456
Caterpillars, Burning Kerosene Cloth in Screen Cone Kills..... 305
Caterpillars, Fire Basket Used to Kill..... 151
Catfish, Giant, Fishermen Catch with Hooks on Poles ..... 271
Cathedral, Rheims, International Fund Desired to Restore..... 485
Cats and Dogs in London, Hotel for..... 680
Cats, to Kill Rats, Belgium Paying Well for. 873
Cattail Stems, Cheap Arrows Made from.... 150
Cattle, Apple Pomace Fed to..... 399
Cattle, Beef, Beet Sugar By-Products Fatten 413
Cattle, Heated Watering Trough for..... 612
Cattle Subway, Concrete Viaduct over..... 186
Cattle Train, Auto Truck, 15 Tons Carried by 269
Cattle, Wild, Trap to Catch..... 636
Cavalryman, Loss of Legs does not Prevent from Riding ..... 118
Caverns, Ice Lined, in Northeastern Iowa... 713
Cellar Doors, Bolting Apparatus for..... 797
Cellars, Lioness Drives Townspeople to..... 55
Celluloid, Radius Gauge for Draftsmen Made from ..... 772
Celluloid, Transparent, Piano Keys Repaired with ..... 767
Celluloid Windows in Auto Tops, Paper Clips Used to Fasten..... 135
Cellulose Substitute, Treated Gelatin Used to Make ..... 561
Cement Bases, Wooden Porch Columns Supported by ..... 445
Cement Coating, Concrete Protected from Heat by ..... 504
Cement for Broken Eyeglasses..... 636
Cement, Grease Gun Used to Apply..... 775
Cement, Lens, White of Egg Used as..... 154
Cement of Slag, Lime, and Gypsum Good for Marine Work ..... 77
Cement, Repair, Chewing Gum Used as..... 797
Cement, Toy Blocks Made of..... 954
Cement Walks, Nails Hold Together..... 951
Cement Water Pipe Unions, Western City Uses ..... 581
Cemetery Gateway Outlasts Adobe Wall..... 724
Center Scraper for Lathe Work..... 778
Center Square and T-Square, Tool Forms... 152
Century Plant Blossoms Unnoticed in Desert ..... 548
Chain Conveyor, Stevedores Protected from Danger by ..... 65
Chain, Cycle, Varnish Brush Keeps Clean... 156
Chains of Aeroplane Altimeters, Little Machine Tests ..... 171
Chair and Desk Combined..... 162
Chair and Table, Child's..... 952
Chair, Convertible, Ironing Board or Step-ladder Made of..... 434
Chair Leg Pads, Floor Protected by..... 620
Chair of Diplomacy, Princeton University Planning ..... 836
Chair Rungs, Steel Ring Prevents Slipping Out ..... 123
Chair, Umpire's, at Lawn Tennis Tournament ..... 681
Chair, Walking, for Sick Room..... 900
Chairs, Speedster Auto Seats Made of..... 953
Chalk on File Prevents Lead Particles from Sticking ..... 302
Chambermaids in Apartment Buildings, Truck for ..... 540
Chandelier, Bronze, Missouri Capitol Adorned with ..... 649
Charcoal Sticks, Making..... 946
Chart Sets, Mathematical Knots Untied by. 193
Chassis, Auto, Railroad Tractor Made of.... 324
Chauffeur, Rubber Sole Tip for Shoe of..... 914
Chauffeuses, Britain Asks Uniform Skill of. 360
Checks and Deposit Slips, Indexed Case for. 541
Cheese, World's Largest, Wisconsin Factories Make ..... 336
Cheesecloth Tank, German Camoufleur Builds 367
Chemical Filters, Wool Used as..... 539
Chemical, Fire Extinguisher, Production of. 726
Chemical Processes, Secret, Government Experts Install ..... 583
Chemical Tests, Dangerous Ocean Currents Spotted by ..... 266
Chemicals, Invisible Writing Without..... 310
Chemicals, Warning Signals in Mines to be Odors from ..... 386
Chemicals, X-Ray Analyzes ..... 816
Chemistry—Stopcock for Liquids, By-Pass for Gas on..... 437
Chemists, Canadian, National Institute Formed by ..... 264
Chemists, New Alkaloid in Desert Shrub Discovered by ..... 919
Chemists, New Foods Evolved by..... 706
Chess Player, Expert, Forty against..... 834
Chest, Electric Lock for..... 794
Chest for Tools, Caissonlike, Holds Many Supplies ..... 507
Chest, Tools for Home Contained in..... 435
Chestnut Tree, Huge, Dynamite Humbles... 553
Chevrons and Wound Stripe, Marine Corps Drum Decorated with..... 610
Chicken Coop, Telescoping, Protection Assured by ..... 122
Chicken Feeder, Tin Can Used to Make..... 958

Chicken House Nests and Roosts, Burlap Used on ..... 140
Chicken Houses, Discarded Linoleum Weatherproofs ..... 779
Chicken, Live, Small Animal Trap Baited with ..... 792
Chicken Runway, Poultry House on Posts Provides ..... 294
Chicken Troughs, Pump Tubes Used to Make 930
Chickens, Buttermilk from Dairy Fed to.... 538
Chickens, Hover Aids Hens in Caring for... 378
Chickens, Poultry House Door Opened by... 625
Chickens, Rat Poison Box Protects..... 622
Chickens, Trappers Feed Wild Animal Carcasses to ..... 756
Child, British Indian, Lily Pad Supports.... 760
Child's Doll Carriage, Wire Replaces Worn Tires on Wheels of..... 315
Child's Play Window..... 945
Child's Table and Chair..... 952
Child's Toy Garden, Real Plants in..... 946
Children, Aeroplane's Landing Fatal to..... 407
Children, Curved Fur Muff for..... 275
Children, Japanese, Toy Made by..... 761
Children, Rubber Used to Model Britain's Premier for ..... 236
Children, Russian, American Food Supplied to ..... 97
Children, Three Wheeled Auto for..... 342
Children, Toy Rocker for..... 305
Children's Banks Conducted on Conventional Lines ..... 879
Children's Clothes, Hall Rack for..... 150
Children's Pages.....120, 280, 440, 600, 760, 920
Children's Toy Machine, Pulley for..... 307
Chimney, Flower Box Built on..... 632
Chimney, Gun Discharge Dislodges Soot in. 462
China Egg in Chicken House, Snake Trapped by ..... 406
Chip Catcher, Bit Brace for Overhead Work Has ..... 135
Chips in Slots of Boring Mill, Preventing... 621
Chips, Yellow Pine, Paper Pulp Made of.... 169
Chloroform and Blotting Paper, Paint on Clothes Removed with..... 127
Chopper, Food, Trough for..... 953
Chopper, Razor Blades Used to Make..... 125
Christmas Tree, Metal Candlesticks Replace Tapers on ..... 598
Christmas Trees, Hauling..... 932
Chronometer, World's Record Precision Won by ..... 670
Chuck and Drills, Square or Hexagonal Holes Cut with .....407
Chuck, Hardened, Slots Cut in..... 291
Chucks, Magnetic, Device Increases Use of.. 591
Church, Adobe, Buttresses Prop Walls of... 692
Church Auditorium, Aeroplanes Displayed in 902
Church Auditorium, Glass Sounding Board for ..... 558
Chute, Ash, Steps in Kitchen Saved by..... 144
Chute Hooks, Springs Support..... 941
Chute, Metal, Fire Escape on Infants' Home Is ..... 566
Chute, Print Trimmings Carried to Waste Can on ..... 477
Chutes, Safety Exits from Arsenal Lead down ..... 587
Cicada Interesting Visitor..... 188
Cider Evaporator, Steam, Apple Jelly Made with ..... 363
Cider Mills, Cattle Fed on By-Products of... 399
Cigar Box, Electric Bell Sounding Board Made of ..... 792
Cigarette Lighter, Brass Nut and Two Pennies Used to Make..... 219
Cigarette Tube, Thirst Allayed by..... 74
Cinders, Houses Built with Concrete Made of 834
Cinders, Locomotive, Plant for Handling.... 427
Circles, Large, Compass for Making..... 621
Circus, Air, Balloon Parade in..... 103
Circus Women, Record Size Shoes for..... 836
City for Sale..... 665
City Lots, Vacant, Wild Flowers Beautify... 564
City, Model, Children Taught Rules of Safety with ..... 600
City of Panama, Celebrating Founding of... 703
City of 20,000 without Mail Carriers..... 828
City, 2,000 Motorboats Feed, by H. H. Dunn. 721
City Waste, Government Encourages Reclamation of ..... 497
Civic Features That Promote the Comfort and Enjoyment of Visitors and Residents. .....90, 588, 750, 910
Civic Kitchen, Buffalo, N. Y., Has..... 712
Claims, Oil, Filing in Mexico..... 720
Clamp, Air, for Drill Press..... 614
Clamp for Ball Races, Garage Has New Tool in ..... 417
Clamp for Motorcycle Handlebar, Vacuum Bottle Held by..... 312
Clamp for Saw, Carpenter's, Sticks Used to Make ..... 451
Clamp for Searchlight, Tire Repairs Aided by ..... 287
Clamp for Workbench Radiator for Auto Held by ..... 597
Clay, Oil-Treated Bridge Floors Covered with ..... 774
Clerk, File, Wooden Pins Used by to Locate Missing Papers ..... 776
Cliff Dwelling, Bean Found in, Sprouts..... 74
Cliff, Soldier in France Plunges over..... 347
Climate of African Desert, Proposed Artificial Lake to Improve..... 579
Clinic, Diagnostic, in New York, by W. F. Goodwin ..... 865
Clip, Ball, Towel Hanger..... 300
Clip for Papers as Key Ring..... 635
Clip for Papers, String and Metal Strips Used to Make..... 299
Clip for Photographic Films..... 797
Clips, Paper, Celluloid Windows Fastened in Auto Tops with..... 135
Clips, Test, are Insulated..... 938
Clock, Alarm, for Store..... 310
Clock, Candle Operates..... 149
Clock Dials, 24 Hours Marked on..... 888
Clock for Factory, Hands Made Wide on.... 159
Clock, Lubricating Vapor from Kerosene in. 637
Clock of Aeroplane Parts, Airman Makes... 430
Clock, Pocket, Sidereal and Solar Time on.. 256
Clock, Pocketknife Used to Carve..... 748
Clock, Reminder, Gravity Made Use of in... 916
Clock, Thin, Mirror or Picture in Frame below Face of..... 754
Clockwork and Motor, Traffic Semaphore Operated by ..... 880
Closet for Fruit, Ventilated, Waste Space Utilized by ..... 373
Closet, Warming, for Kitchen..... 606
Clothes Hamper ..... 914
Clothes Hanger, Revolving Hook on ..... 754
Clothes Hanger, Rotating..... 619
Clothesline Reel and Tightener..... 756
Clothesline, Self-Tightening Holder for..... 596
Clothespin, Photographic Film Clip Made with ..... 797
Clothespins, Saw Rack Made from..... 939
Clover Seed Harvester, Ripe Heads Only Picked by ..... 687
Clover Seed, Tin Can Used to Gather..... 792
Clubhouse Plan, Dwelling for Employes on. 873
Coal and Ashes, Single Mechanism in Paper Mill Handles ..... 570
Coal Cargo, Record, Great Lakes Steamer Carries ..... 670
Coal, Carloads of, Chinese Sprinkle Whitewash on to Prevent Theft of..... 678
Coal Deposits in Greenland, Discovery of.... 260
Coal Exporters, Australian, Bidding for Philippine Trade ..... 897
Coal Frozen in Cars, Oil Burners Used to Thaw ..... 532
Coal in Pebble Form, Susquehanna River Yields ..... 54
Coal, Mechanical Stoker on Locomotive Feeds ..... 398
Coal Mine, Geophone Aids in Rescue of Trapped Miners in..... 2
Coal Mine Silt, Waste, Fuel Derived from... 412
Coal Mine Winding Machine, Interesting Control for ..... 558
Coal Miners' Safety Lamp, Benzine Used as Fuel in ..... 762
Coal Mines, African, Grow in Importance.... 734
Coal Mines Flooded by Germans, Water Pumped Out of..... 736
Coal Mining, Artist Corrects Popular Idea of 668
Coal on Ships, Negro Women Carry..... 577
Coal Pile Fire, Portable Belt Conveyors Used to Fight ..... 677


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Coal Pits, Long Pipe Nozzle for Fighting Fire in ..... 394
Coal Trucks, Unloader for..... 715
Coal Yard, Government Operates in City of Washington ..... 53
Coast Artillery College Courses to be Revised ..... 56
Coast Guard, Navy Plans to Annex..... 192
Coat, Emergency, Unlaces for Quick Removal ..... 164
Coat Hanger, Overhead, Factory Uses..... 125
Coat Hanger, Rolled Newspaper Tied with Cord in Center Is..... 619
Coat Hook, Glass Headed Push Pin Used as. 152
Coat Rack, Extra, for Parties..... 156
Cobblestones, Asphalt Pavement Base Made of ..... 913
Cockatoo and Parrot Industry, by J. E. Hogg 707
Cockleburs, Valuable Oil from, by S. R. Winters ..... 859
Cockroaches, Trap Used to Catch..... 153
Coconut, Vase Made from..... 950
Code, Cable, in Nine Languages, Trade to be Encouraged by ..... 356
Code Calls of Electric Horn, Men Summoned by ..... 533
Codfish Market, World's Greatest, St. John's Is ..... 40
Coffee Cup, Steaming, on Sign, Restaurant Advertised by ..... 581
Coffeepot, Creamer, and Sugar Bowl Nest Together ..... 115
Coffeepot, Safety Pin Repairs Hinge on Lid of ..... 473
Coffer for New York City, Venice Guilds Give ..... 28
Coil, High Frequency, Lightning Made for Moving Picture Scenes by..... 220
Coins, Bad, Electric Eddy Currents Used to Detect ..... 586
Coke Fuel, Boiler Corrosion Caused by..... 836
Collar and Cravat Combined..... 115
Collars, Machine for Ironing, Human Skill Displayed by ..... 593
College Course in Highway Transport..... 516
College Courses in Coast Artillery to be Revised ..... 56
College, War, at Washington Renamed..... 922
Collision, Auto Crushed between Cars in.... 869
Collision—Drawbridge, Ship Damages..... 119
Collision, Rear End, Elevated Trains in..... 731
Collodion, Manuscripts Preserved by Applying ..... 445
Colors, Rainbow, of Insects, Scientists Explain ..... 14
Comb, Pencil Clip Attached to..... 618
Comment and Review, by H. H. Windsor.... .....33, 177, 817
Commerce—Commercial Survey of Amazon River, Brazilians Make..... 864
Community Work, Chinatown Has Own Moving Pictures for..... 32
Commutators, Sand Block Polishes..... 449
Commuters, Motorboat with Auto Speed for. 840
Compass, Large Circles Made with..... 621
Compass Needle of Direction Indicator, Buzzers Rung by..... 15
Compass, Radio, Ships Easily Learn Location by ..... 354
Compressed Air Hammers, Concrete Ship Tamped by ..... 325
Compressed Air, Typewriter Cleaned by..... 937
Compressor and Engine, Park Trees Sprayed with ..... 701
Concrete and Chain Fence, Tractors Kept in Field by ..... 810
Concrete and Steel Park Bench, Immovable. 756
Concrete Aqueduct, Swamps Impede Builders of ..... 559
Concrete Arch, Mammoth, Costly Theater Has ..... 408
Concrete Basin, Memorial Surrounded by Water in ..... 91
Concrete Bridge Building, Portable Arches Simplify ..... 753
Concrete Bridge in Oregon, Remarkable Span for ..... 650
Concrete Bridge in Sweden, One of World's Largest ..... 728
Concrete Bridge, Longest Arch Claimed by.. 863
Concrete Bridge over Mohawk River, Plan for ..... 506
Concrete Bridge, Reinforced, Lightning Damages ..... 555
Concrete Bridges, Dead Soldiers' Names Given to ..... 68
Concrete Canal, Curious Method Used to Enlarge ..... 908
Concrete, Cement Coatings Protected from Heat by ..... 504
Concrete Covered Pipe, Huge, Railroaded to River Bed..... 376
Concrete Dam, River Ford on Top of..... 496
Concrete Dock, London Has..... 714
Concrete Dome, Huge, Danish Theater Crowned with ..... 897
Concrete Dry Dock in Hawaiian Islands, Dedication of ..... 667
Concrete Elevator Explosion, Steamer Wrecked by ..... 664
Concrete Flowerpots, Pails as Molds for.... 124
Concrete Gondola Car, Tests of..... 196
Concrete Grain Elevators, Farmers' Associations Build ..... 209
Concrete Hangar, Government, is Fireproof. 203
Concrete Highway Built in Three Strips.... 676
Concrete, Impervious, English Inventor Evolves ..... 71
Concrete Inclosures for Trees..... 111
Concrete Jackets, Poles Anchored with..... 858
Concrete Jetties, Lighthouse Protected from Sea by ..... 702
Concrete Logs, Garden Entrance Made of... 111
Concrete Mine Supports..... 762
Concrete Monument Construction, Expense Saved by ..... 187
Concrete Monument, Novices Fashion..... 814
Concrete of Cinders, Houses Built with..... 834
Concrete Oil Tank, Huge, is Leak Proof.... 230
Concrete Pergola, Rustic, Hotel Grounds Adorned with ..... 584
Concrete Platforms, Raised, Street Safety Zones Have ..... 910
Concrete Posts, Hole in Ground Molds..... 278
Concrete Refrigerator, Microbes Find No Crevices in ..... 324
Concrete Road Construction, Concave Roller Assists in ..... 520
Concrete Road Markers, Southern State Using ..... 589
Concrete Road, Unbalanced Engines Used to Tamp ..... 406
Concrete, Rodding Increases Strength of.... 134
Concrete Rolling Stock, Holland Constructing ..... 99
Concrete Roof, Precast, Fits Together like Puzzle ..... 833
Concrete, Scenic Feature Preserved by Reinforcing with ..... 198
Concrete, Sectional Ditch Bottom Made of.. 374
Concrete Sewage Pumping Station, Automatic ..... 400
Concrete Ship, Beach Pounding Does Not Harm ..... 241
Concrete Ship, Compressed Air Hammers Tamp ..... 325
Concrete Ship, Launching of at Mobile, Ala. ..... 719
Concrete Ship, Sides Built in Flat Precast Units for ..... 331
Concrete Strip, Skidding on Asphalt Road Prevented by ..... 90
Concrete Ship, Unusual, for Salvaging..... 371
Concrete Silo Blocks, Bridge Arch Made of. 52
Concrete, Spouts Used on Building to Pour. 240
Concrete Tables and Benches in Western Cañon. ..... 911
Concrete Tank Edges, Protecting..... 942
Concrete Test Cylinders, Paper Molds Used to Make ..... 896
Concrete Units, Reinforced, Floors Built with ..... 118
Concrete Viaduct, Novel Expansion Joints for ..... 877
Concrete Walk Glare, Creosote and Green Dye Spray Overcomes..... 197
Concrete Wall, Tank Used to Raze..... 525
Concrete Water Tank, Attractive Tower Conceals ..... 901
Concrete Wireless Mast, Wall of Peking Topped with ..... 857

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Concrete Works, Harbor at Valparaiso Improved by ..... 702
Condenser, Auxiliary, Oil Cooled by on Steamship "Anoka" ..... 739
Condenser, Vapor, for Automobile Radiators 728
Conference, Trade, International Currency Suggested by ..... 821
Conner, Sam E.:
Bees' Stingers Make Profitable Crop..... 355
Conservatory, "Tower of Jewels" Glass in Dome of ..... 586
Construction, Precast, Roof of Panama Pier Has ..... 832
Containers, Wood Pulp, Machine Speedily Makes ..... 116
Contest—Aeroplane "Economy Run," Cost of Commercial Flying to be Established by.. 342
Contractors, Excavating, Bunkers Used by to Keep Shovels Working ..... 735
Convention, Large Typewritten Letter Sent to ..... 430
Conveyor, Bucket, Crushed Stone Unloader Made with ..... 763
Conveyor, Chain, Stevedores Protected from Danger by ..... 65
Conveyors, Portable, Coal Pile Fire Fought with ..... 677
Convict, Bone Penholders Carved by with Crude Tools ..... 762
Cooking, Home, Americans Gone to France to Teach ..... 240
Cooking Table, Steam, in Field..... 860
Cooking Utensils, Rack for..... 610
Coop, Telescoping, Chickens Protected by... 122
Cooper—Shaping Machine Makes Paper Barrels ..... 384
"Cooties," Locomotive Steam Used to Kill.. 386
Copper Diaphragms, Steam Cookers of Submarine Base Made Safe by..... 583
Copper or Brass Tubing, Splicing with Wire 799
Copper, Stamped, Life Preservers of..... 417
Copper Tubing, Seamless, for Elastic Gas Connection ..... 222
Cork, Ground, Condensation on Pipes Stopped with Coat of..... 214
Cork Scraps, Water Wings Made of..... 159
Corks, Heel Slipping Prevented by..... 969
Corks, Loop of Cord Aids in Pulling..... 436
Corks, Rubber, as Vibration Absorbers..... 157
Corn Borers, Liquid Fire and Steam Used to Kill ..... 585
Corn Popper, Dried Fruits Washed in..... 925
Corn Shock Binder..... 764
Cornerstone Laying in New York of Largest Assay Office in World..... 364
Corral, French, German Peace Delegation Kept in ..... 17
Corrosion of Boiler, Coke Fuel Causes..... 836
Corrugating Machine, Barrel Blanks Run between Rollers of..... 62
Corsage Pin and Casket, Mrs. Wilson Receives from People of Paris..... 254
Cottage, Hermit Painter's, on Seashore..... 732
Cottages, Shingled Roof Tents Serve as..... 596
Cotter Pin and Ring, Ring Bolt for Canoe Made of ..... 310
Cotton Gin, Early Model of..... 417
Cotton Harvesting Machine, Vacuum System Used by ..... 695
Couch, Spring, Is Garden Seat and Outdoor Bed ..... 447
Countershaft, Heavy, Raised without Using Tackle Blocks ..... 133
Countersinking, Special Shapes, Twist Drill Used for ..... 138
Coupling, Spring, for Sewing Machine Belts 138
Court Plaster, Storax Used to Manufacture. 746
Cover, Glass, for Orange or Grape Fruit.... 754
Cover, Metal, for Tobacco Pipe..... 630
Cow's Udder, Indians of Chile Make Basket of ..... 261
Cranberry Pests, Pacific Coast Growers Fight ..... 730
Crane, Brake Wheel Converted by Lugs into Chain Wheel for..... 618
Crane, Dock, Americans in France Use Junk to Make Electric Cable Connection to.... 119
Crane Equipment on Boats, Shark Hunters Use ..... 675
Crane, Hammerhead, Shipways Served by... 266
Crane, Hay, Barn Space Utilized with Aid of 293
Crane Hooks, Scrapped Ship Plates Used to Make ..... 727
Crane, Locomotive, Railroad Track Transferred with ..... 662
Crane, Locomotive, Railroad Water Tank Lifted by ..... 348
Crane, Wagon Bed Lifted Off with..... 780
Crank, Can Opener Operated by..... 275
Crank Wheeled Stepladder Moved by Turning ..... 364
Crankshaft Tilted Disk Replaces in Rotary Motor ..... 841
Cravat and Collar Combined..... 115
Crawford, R. P.:
Native Bulbs Replace Imported Product in American Gardens ..... 572
Cream for Exportation, Danish Machine Preserves ..... 838
Creek, Auto Somersaults into..... 176
Creosote and Green Dye, Concrete Walk Glare Overcome by Spraying with..... 197
Creosote, Flagpole Protected by..... 608
Crêpe Paper, Artistic Glass Decorations with ..... 467
Crickets, Tree, as Thermometers..... 474
Crimper for Bottle Crown Caps..... 435
Cripple—Arm, Artificial, Cutlery and Tools Attached to ..... 442
Cripple, Artist, Brush Held in Teeth by..... 554
Cripple, Bicycle with Broken Chain for Use of ..... 374
Cripple, Convertible Knife and Fork for.... 915
Cripple—Hand, Mechanical, Shoulder Movements Operate ..... 694
Cripple—Nail Brush for One-Armed Person. 275
Cripple—One-Legged Sportsman, Play Continued by ..... 200
Cripple, Perambulating Hotel for..... 7
Cripple—Woman Typist, Artificial Hand Used by ..... 520
Crippled Soldier, Moving Picture Machine Operated by ..... 40
Cripples, "Mensurgraphy," a Photographic Method of Studying Deformities of, by Robert H. Moulton..... 361
Croquet Arch Visible in Twilight..... 592
Cross, French War, Consul at Cincinnati Decorates Soldier with..... 17
Crosscut Saw, Brace for..... 621
Crossing, Railroad, Tunnel Obviates for Pedestrians ..... 750
Crossing Rights to Autos..... 895
Crossings, Railroad, Passenger Trains Obstruct About Seven Seconds ..... 673
Crowbar, Forked, Flooring Pulled Up with. 460
Crutch Tip, Rubber, Hammer Head Fitted with ..... 777
Crutch to Use on Ice ..... 942
Crystals of Rochelle Salt, Batteries in Telephone Circuits Replaced by..... 184
Cultivator and Harrow Combined..... 109
Cultivator, Motor, Grass Mower for Golf Links Made of..... 329
Cultivator, Tractor, Students Build..... 280
Cup, Paper, Wire Stand for..... 959
Cups, Torches Made of..... 306
Curler for Hair, Aluminum Wire Used to Make ..... 435
Currency Tray, Stairlike, Desk Space Saved by ..... 195
Current Propeller for Boats..... 629
Currents, Dangerous, Chemical Tests for Ocean Spot ..... 266
Curtain Hem, Glove Finger Facilitates Slipping Rod through..... 926
Cutlery and Tools, Artificial Arm Equipped with ..... 442
Cutter, Washer, Old Expansion Bit Used to Make ..... 787
Cyclist, Acrobatic, Beach Crowd Thrilled by. 330
Cyclist, Attachment for Raincoat of..... 959
Cyclone, Minnesota Town Visited by..... 546
Cylinder Diameter Gauge, Dial on..... 767
Cylinder, Metal, Paraffin Reclaimed from Waxed Paper by..... 848
Cylinder, Steam Pipe Calked into..... 606
Cylinder, Steel, Hose on Steam Roller Protected by ..... 69
Cylinders, Automobile Engine, Air Nozzle Removes Carbon from..... 779
Cylinders, Concrete, Paper Molds Used to Make ..... 896

Digitized by Google

Dairy Barn, Round, Chores Quickly Done in 544
Dairy, Chickens Fed on Buttermilk in..... 538
Dam, Concrete, River Ford on Top of..... 496
Dam, Great, Flood Menace Removed by..... 870
Dam, Irrigation, Illumination Protects..... 907
Dam, Lake Level Regulated by, by C. W. Geiger ..... 729
Dam, Otay, Rebuilding, by John Edwin Hogg ..... 379
Damper Shaft, Firm Fastening for..... 137
Dance Floor, Electrified..... 633
Dark Room, Old Aeroplane Box Used as..... 587
Dark Room, Photo, Packs like Suitcase..... 393
Dart, Monoplane, for Child, Rubber Band Shoots ..... 440
Date Palm Leaves, Brooms Made of..... 434
Davenport, Phonograph under Arm of..... 754
Daylight Saving Law, Panama Canal Zone does Not Need ..... 800
Decoys—Pigeon Hunter in Pyrenees..... 891
Deer Antlers, Roof of Taxidermist's Shop Piled High with..... 96
Deformities, "Mensurgraphy," a Photographic Method of Studying, by Robert H. Moulton ..... 361
Dehydrating Mill, Cattle Fodder from Apple Pomace Prepared by ..... 399
Dehydration, Vacuum Process of, Preserves Foods ..... 247
Deliveries, Locking System for Doors Protects ..... 592
Dendrograph, Changes in Sizes of Tree Trunks Recorded by ..... 96
Dental X-Ray Machine, Tube in Cabinet of.. 657
Dentistry—Four Ounce Motor in Dental Tool ..... 901
Dents on Automobile Bodies and Fenders, Removing ..... 290
Derrick, Enormous, Giant Trees Used to Make ..... 542
Derrick, Wagon Bed Removed by..... 780
Desert, African, Artificial Lake Proposed for 579
Desert, Jury Pole on Wagon Helps Escape from ..... 864
Deserts, Flowers of Century Plant Unnoticed in ..... 548
Desk and Bookcase, Combination..... 916
Desk and Chair Combined..... 162
Desk, Bank, Labor and Floor Space Saved by 352
Desk, Desk Blotter Used as..... 622
Desk Drawer, Inverted, Typewriter and Eraser Held by..... 305
Desk, Engagement Reminder for..... 449
Desk File, Sectional, Adjustable Units for.. 442
Desk for Calculating Machine, Table Used to Make ..... 300
Desk Space, Stairlike Currency Tray Saves Space on ..... 195
Desk Tray, Telescoping, Fits Drawer of Any Size ..... 597
Desk, Writing, and Library Table Combined 755
Destroyers, Torpedo Boat, American Shipyards Build 10 in July..... 734
Detectives, Masks Worn by While Inspecting Criminals ..... 98
Detonators, High Explosive, Scattered for Safety ..... 556
Diagram of Electrical Formula, Electrician Aided by ..... 296
Diagrams on Trucks' Sides, Route Advertised by ..... 590
Dials, Twenty-Four Hours Marked on..... 885
Diamond Hunters in Diving Bells, River Bed Searched by..... 907
Diamond in Nose, Indian Visiting U. S. Wears ..... 571
Diamond Mine, South African, X-Ray Used to Locate Secreted Stones in..... 39
Diamond Mines, African Coal Mines Supply Fuel for Operating ..... 734
Diamond Substitute, Australian Stone Proposed as ..... 523
Diamonds, Ocean Bottom to Be Dredged for ..... 537
Diamonds, Shark Hide Used to Polish.... 591
Diamonds, Spring Mountings Used to Display ..... 155
Diaphragms, Copper, Steam Cookers of Submarine Base Made Safe by ..... 583
Diary, Permanent, on Wall Calendar ..... 436
Die and Punch, Blanking and Forming with 617
Die for Use with Hand Punch, Hinge Forms 942
Die Stock from Pipe Fittings..... 615
Die, Wheel Forming, Electric Motors Operate 889
Dies, Cloth, Wood Stained, with ..... 147
Dies, Round, Tongs for Hardening..... 952
Dining Room, Hotel Replicas of Aeroplane Parts Used to Decorate ..... 739
Dinner Pail, First Aid Kits in..... 935
Diplomas, Memorial, France Adopts for Honoring Dead Soldiers ..... 720
Dipper for Soldering Paste..... 612
Direction Indicator, Blind Man Invents..... 15
Dirigible, Blazing, Crashes through Bank Roof ..... 357
Dirigible Blown Helplessly about With Atlantic ..... 370
Dirigible, British, Makes Pioneer Round Trip over Atlantic Ocean, by Paul A. Jenkins.. 326
Dirigible, Houses Shaken by Explosion of.. 426
Dirigible, Passenger, will Cruise to Brazil.. 570
Dirigible "R-34," American Newspaper Carried by ..... 574
Dirigible System, Electric Trolley, Man Proposes ..... 239
Dirigible, World's Largest, Britain Building 554
Dirigibles, Germany Plans Service to America with ..... 566
Dirigibles, Government Departments may Use ..... 204
Dirigibles, Performances Test..... 214
Dirt and Grease, Sandpaper Removes from Carborundum Wheel ..... 766
Discoverer, South Pole, North Pole Sought by ..... 741
Disease, Crossbreeding Fruits and Grains Makes Them Immune to, by R. H. Moulton 562
Disease—Typhus in Poland, Drastic Measures to Prevent Spread of..... 598
Disease—Yellow Fever, Sanitation Frees World from ..... 802
Diseases of Tropics, Shipboard Laboratory for Studying ..... 542
Dishes, Hot, Mitten for Lifting ..... 624
Dishwasher, Kitchen Table When Open Is.. 115
Dishwashing Machine and Tea Wagon Combined ..... 277
Dishwashing Machine, Water Power..... 928
Disk Cutter, Old Expansion Bit Used to Make ..... 787
Disk, Tilted, Crankshaft in Motor Replaced by ..... 841
Dissection Work, Aerial Searchlight Projects 745
Ditch Bottom, Sectional, Made of Concrete.. 374
Divers in Thrilling Feats, Photographer Snaps ..... 654
Diving Bells, Diamond Hunters Search River Bed in ..... 907
Dock, Concrete, London Has..... 713
Dock Crane, Americans in France Used Junk to Make Electric Cable Connection to ..... 119
Dock, Dry, Sweden to Have on Land..... 823
Dock, Manila to Have Largest in World.... 731
Docks, Dry, Panama Canal Has ..... 711
Documents, Precious, Unbleachable Ink for 2
Dog, "Buster," Campaigns for Bond Issue Votes ..... 588
Dog Kennel for Traveling ..... 914
Dog, Seal Mothered by ..... 281
Dog Sled, Wheel Mounted, Alaskan Uses.... 560
Dog, "Vic," German Sausage Refused by.. 121
Dog, Wire Basket on Auto Running Board for ..... 787
Dogs and Cats in London, Hotel for..... 680
Doll Carriage Wheels, Worn Out, Insulated Wire Replaces Tires on..... 315
Doll Furniture, Steel Used to Make..... 920
Doll, Plants Form Dress of..... 785
Doll, Rubber, Britain's Premier Modeled as. 236
Dome of Greenhouse, "Tower of Jewels" Glass in ..... 586
Dome, Wisconsin Capitol, Electrical Welcoming Sign on ..... 751
Door and Ladder, Combined Silo Improved by ..... 659
Door, Floor, Counterbalanced ..... 774
Door, Handle Made from Shovel Grip for.. 301
Door Knob Used as Faucet Handle ..... 785
Door of Freight Car, Attachment Opens.... 834
Door, Single, Two Car Garage Has..... 827
Doorbell Ringing Transformer for Lamp Socket ..... 274
Doormat, Boycotting German Goods Advocated with ..... 681


Digitized by Google

Doors, Cellar, Bolting Apparatus for ..... 797
Doors, Folding, for Garage ..... 923
Doors, Gambling House, Coast City Police Collect ..... 32
Doors, Lift, for Factory Entrances..... 253
Doors, Locking System for Deliveries Protected by ..... 592
Doors on Gangways Locked, Trespassers on Railroad Property Roofs Barred by..... 396
Doors, Vise for Planing..... 934
Doorstop, Simple ..... 795
Dough for Bread, Sea Water Used to Mix.. 567
Doughnut and Coffee Pot Features Salvation Army Float ..... 13
Doughnut Cutter for Fairs, Automatic .... 657
Drafting Pen, Dotted or Full Lines Made with ..... 101
Draftsman, Shade for Drying Ink Handy for ..... 457
Draftsman, Simple Rack for..... 604
Draftsman's Erasing Shield, Old Film Makes 959
Draftsman's Lamp, Bracket for ..... 941
Draftsman's Pen, Double Point, Writes with Two Kinds of Ink ..... 442
Draftsman's Powder Can Holder ..... 136
Draftsman's Rule, Circles Drawn with.... 285
Draftsman's T-Square, Bevel Protractor on ..... 797
Draftsmen, Radius Gauge for..... 772
Draftsmen, Thumb Tack and Lifter Aid to. 557
Drag, Auto Pulled, Lawn Graded with.... 98
Drag, Tractor Drawn, Roads Kept in Shape by ..... 251
Drain Holes, Drilling in Auto Axle ..... 300
Drain Pipes or Sink, Plugged Up, Gasoline Used to Clean ..... 447
Drainage, City, Street Gutter Snowplow Keeps Open ..... 174
Drainage Project, Florida Swamps to be Reclaimed by ..... 172
Drainage Tunnel, Gold District Unwatered by, by J. E. Murphy ..... 742
Drawbridge Across Track, Time Saved by... 268
Drawer Handle, Shelf for Filing Cabinet Hangs on ..... 662
Drawer Handles, Wire, Used for..... 124
Drawer, Inverted, Typewriter and Eraser Held by ..... 305
Drawer, Open, Table Supported by..... 297
Drawing, American Soldiers Study in German School ..... 749
Drawing Board for Artists..... 769
Drawing Ink, Device for Drying..... 457
Drawing, Isometric, Triangle for..... 926
Drawing on Glass, Ink Used for..... 299
Drawing Table, Dresser Used to Make..... 151
Drawing Table, Library Table can be Converted Into ..... 765
Dreams of Shell Shocked, Clue to Cure Given by ..... 229
Dredge Boat, Common Jacks Raise ..... 267
Dredge Cutter, Rotary, Welding Job Repairs 418
Dredge, Diamonds in Ocean Bottom to Be Searched Out by..... 537
Dredges, Hydraulic, Coal Pebbles Pumped from River with..... 54
Dresser, Drawing Table Made of..... 151
Dresser, Old-Fashioned, How to Modernize. 607
Dressing for Automobile Tops ..... 136
Driftwood, Hermit Painter Adorns Cottage with ..... 732
Drill and Tap Stands, Shop Work Made Easier by ..... 433
Drill, Bench, Weight Feeds ..... 794
Drill, Electric, Rivet Holes Countersunk with ..... 508
Drill Hole, Electric Light Bulb Boils Water Out of ..... 436
Drill, Homemade, Profitable Mine Located with ..... 568
Drill Jig for Round Stock ..... 461
Drill, Mine Stoping, Air Rotates..... 846
Drill Press, Air Clamp for ..... 614
Drill, Radial, Motor and Spindle on Arm of. 680
Drill, Removable Parting Lip for Auger Bit ..... 286
Drill, Sliding Head Gang, Has High Speed.. 190
Drill, Square Holes Cut with..... 557
Drill, Testing, Samples Cut from Pavement with ..... 872
Drill, Twist, Countersinking Special Shapes with ..... 138
Drilling Machine on Huge Protractor, Ship Timbers Drilled by ..... 372
Drills for Square or Hexagonal Holes..... 407
Drills, Grinding of to Obtain Faster Work.. 775
Drills, Oil Discoveries Fill Ohio Village Yards with ..... 496
Drinking Cups, Torches Made of..... 306
Drinking Fountain, Germ Free..... 802
Drinking Fountain, Horses in Pasadena Provided with ..... 589
Drinking Fountain, Tubing Converts Faucet Into ..... 146
Drive Chain, Idle Sprocket Keeps from Flopping ..... 127
Drive Chains of Motorcycle Oiled While Running ..... 937
Drug—Caffeine, American Holly Contains... 917
Drugless Drug Store, Everything but Drugs Sold by ..... 730
Drugs, Dye Industry Necessary to Manufacture of ..... 863
Drum of Marine Corps, Wound Stripe for.. 510
Drum, Wire Cut to Length on..... 124
Drums, Electric, Building Moved with..... 879
Dry Cell, Flashlight Made by Putting Metal Strip on ..... 276
Dry Cells, Warmth Necessary for Best Work of ..... 284
Dry Dock, Great, in Hawaiian Islands .... 496
Dry Dock in Hawaiian Islands, Dedication of ..... 667
Dry Dock, River Houseboat Uses Piles for.. 855
Dry Dock, Swedish, on Land..... 824
Dry Dock with Huge Tank, Submarines Tested by Germans in ..... 184
Dry Docks for Small Boats on Lake Merritt, by C. W. Geiger ..... 729
Dry Docks, Panama Canal Has ..... 711
Drying Machine for Fruit, Waste Saved by. 843
Ducks, Wild, Stray Shot Diet Kills..... 705
Dugout Porches, French, Huge Helmets Are Roofs for ..... 336
Dugouts, Primitive Colombian Shipyards Produce ..... 745
Dummy, Wooden, Wrestler Practices Head Hold on ..... 4
Dunn, H. H.:
Teaching the Mississippi to Brush Its Own Teeth ..... 8
Two Thousand Motorboats Feed a City... 721
Dust Explosions in Elevators, Model Shows Danger of ..... 753
Duty, Export, International Lumber Mill Escapes Payment of ..... 869
Dwarf Trees, Growing of..... 309
Dye Industry, Future of War and Medicine Depends on ..... 863
Dyes, American, Textile Industry to Use.... 878
Dyestuffs and Medicinal Preparations, Government Experts Install Secret Chemical Processes for ..... 583
Dyewood from Argentina, Sailing Ship of Old Brings ..... 86
Dynamite Blasts, Bank Vault Broken Up by 244
Dynamite, Canal in Louisiana Completed with ..... 596
Dynamite Charges, Generating Plant Stump Drills Driven by..... 52
Dynamite, Huge Tree Humbled by ..... 553
Dynamo, Engine, and Motor in German Train Drive ..... 7
Dynamo, Pocket Flashlight Has ..... 804

Eagle, Airmen Chase in Aeroplanes..... 724
Eagle, One Headed, on New German Emblem ..... 868
Easter Illumination, Crosses of Light as.. 4
Eclipse, Annular, of the Sun, by L. J. Wilson ..... 757
Eclipse Expedition by Airplane, Misfortune Hounds ..... 329
Edholm, Charlton Lawrence: Wings (Poem) 24
Education—Dissection Work, Aerial Searchlight Projects ..... 745
Education—Japan, Wild Life Experiment Station Planned in ..... 864
Education—Museums, Natural History, Russians Establish on Streets..... 728
Education of Foreigners, Moving Picture Shows to Promote ..... 698
Education, Recruits in Regular Army Offered New Opportunities for..... 164

Digitized by Google

Education—Soldiers, American, Study in German School ..... 749
Edwards, Harlan H.:
Water, the Maker and Destroyer of Roads 232
Egbert, Howard:
To the Pole via Aeroplane..... 679
Egg Beater, Fan, and Drill, Electric Motor Equipment Contains ..... 914
Egg Beater, Motor Driven..... 319
Egg, China, in Chicken House, Snake Trapped by ..... 406
Egg, Fossil, of Æpyornis..... 108
Egg in Bottle, How to Place..... 956
Egg Trick, Self-Balancing..... 315
Egg, White of, Emergency Lens Cement Made of ..... 154
Eggs, Brine Used to Test ..... 159
Eggs, Padded Tray for Collecting..... 286
Eggs, Preservation of ..... 302
Eggshells, Artificial Ivory from..... 444
Electric Alarm, Silent, on Wrist Watch..... 758
Electric Arc, Rock for Tunneling Work Cut with ..... 526
Electric Cable Connection for Dock Crane, Americans in France Use Junk to Make.. 119
Electric Cable, Unusual, One-Piece Lengths of ..... 48
Electric Cars in Albuquerque, Women Operate ..... 532
Electric Drill, Rivet Holes Countersunk with 508
Electric Driven Milling Machine, Enormous, Is Fine Precision Tool..... 717
Electric Eddy Currents, Bad Coins Detected by ..... 586
Electric Engine, Model ..... 948
Electric Fan, Sign Displayed by ..... 941
Electric Fan, Voltage Regulator Allows Universal Use of ..... 342
Electric Fire Alarm Gong Hammer, Motor Operates ..... 720
Electric Flashlight Bulb for Mending Gloves 153
Electric Fruit Juice Extractor ..... 904
Electric Furnace, Gun Steel Manufacture Shortened by ..... 224
Electric Furnace, New, Hearth Forms One Electrode of..... 917
Electric Glass Splitter, Heated Ribbon Used on ..... 599
Electric Horn, Coded Calls for Men by..... 533
Electric Hot Plate, Feet of Navy Men Warmed by ..... 277
Electric Iron, Signal Lamp for ..... 475
Electric Lamp Globe, Induction Coil Produces Sparks in..... 628
Electric Lamp, Nonactinic Rays Given Off by ..... 524
Electric Lamp Run in Series with Arc..... 4
Electric Lamp, Small Fountain Operated by ..... 276
Electric Lantern Lights When Lifted..... 158
Electric Light Fixtures, Adjustable, Open Knuckle Joints for..... 394
Electric Light Globe, Burned Out, for Fishing Floats ..... 158
Electric Light Globe, Drill Hole Dried Out with ..... 436
Electric Light Globes as Targets..... 477
Electric Light Globes, Tool Removes .... 133
Electric Light, Indirect ..... 786
Electric Light Key Sockets Changed to Pull Sockets ..... 311
Electric Light, Photograph Printing Frame Suspender for ..... 787
Electric Light Plant, Hot Water from, Heats Town Hall ..... 556
Electric Light, Soldier's Helmet Makes.... 828
Electric Light, White Porcelain Shade for... 914
Electric Lighting System for Farmhouses, Portable Bungalow Demonstrates..... 245
Electric Lock, Chest Has..... 794
Electric Machine, Lead Seals Cast with..... 573
Electric Machines, Sound Vibrations Control 862
Electric Mangle for Wringer of Home Laundry ..... 653
Electric Motor, Naval Vessel Driven by..... 646
Electric Motor, Portable Band Saw Driven by ..... 727
Electric Motor, Set of Attachments, Egg Beater, Fan and Drill in ..... 914
Electric Motor, Spindles on Shaper Driven by ..... 423
Electric Motor, Toy, Yarn Wound with..... 949
Electric Motors, "New Mexico" Driven by... 646
Electric Motors, Wheel Forming Die Operated by ..... 889
Electric Phonograph, Table Lamp Combined with ..... 276
Electric Power Plant, Portable, for Laboratories ..... 564
Electric Pumps, Flooded Coal Mines Pumped Out with ..... 736
Electric Radial Drill, Motor and Spindle on Arm of ..... 680
Electric Radiators, Ships of U. S. Navy Heated by ..... 279
Electric Railroad Cars, Small Semaphores Protect at Switches ..... 739
Electric Railroad, Repair Equipment Stations Adopted by ..... 229
Electric Scrubbing Machine, Carpets Cleaned on Floor with ..... 873
Electric Searchlight, Aerial, Dissection Work Projected by ..... 745
Electric Sewing Machine Closes like Desk.. 911
Electric Shears, Speed and Safety Combined in ..... 405
Electric Sign—Steaming Coffee Cup Restaurant Advertisement ..... 581
Electric Siren, Army Bugle Replaced by .... 50
Electric Smelters, Iron Ore, Planned for Dutch East Indies ..... 744
Electric Spanker ..... 921
Electric Starters, Seaplanes Supplied with.. 245
Electric Systems, Connected, Conservation Measure Adopted During War ..... 678
Electric Thermometer, Distant Temperatures Read by ..... 746
Electric Ventilator, Also Fan and Deodorizer 434
Electric Welcome Sign, Wisconsin Capitol Has on Dome ..... 751
Electric Welding Process, Metal Plates Joined by ..... 378
Electric Wires, Soldering Coppers for..... 469
Electrician's Memory, Diagram of Electrical Formula is Aid to..... 296
Electricians, Naval, Trained on Land Ship... 829
Electricians, Soldering Iron Stove for .... 771
Electricians, Telephone Receiver to Distinguish between Alternating and Direct Current Used by..... 316
Electricity Charges, Static, Bell Rung by.... 316
Electricity—Dry Cells Work Better When Warm ..... 284
Electricity—House Lights, Series Parallel Switching for ..... 292
Electricity—Hydroelectric Plant at Gatun Doubles Output ..... 432
Electricity—Hydroelectric Plant for Parana River ..... 703
Electricity—Hydroelectric Plant, Nipigon River to Have..... 714
Electricity—Hydroelectric Power Plant for Canadian Cities ..... 552
Electricity—Hydroelectric power Plant, Victoria Falls to Have..... 701
Electricity—Light, Indoor, at Small Expense ..... 443
Electricity—Lineman, Powerful Electric Current Fails to Kill ..... 524
Electricity—Lost Silver, Electrical precipitation Saves ..... 518
Electricity, Pasadena's Houses All Wired for ..... 109
Electricity, Portable Planing Machine Operated by ..... 488
Electricity—Safety Insulated Test Clip .... 938
Electricity, Sodium as Conductor of, Germans Considered ..... 191
Electricity, Suburban Railroads of Berlin to Be Operated by..... 373
Electricity—Switch for Battery Circuits, Screen Door Hook Forms..... 288
Electricity—Transformer Coil, Adjustable, Welding Set Regulated by ..... 746
Electricity—Tray Rack, Electric Heated, Hospital Patients Served from ..... 107
Electricity—Trolley Dirigible System, Man Proposes ..... 239
Electricity, Water Heated in Boiler with.... 392
Electrocution, Lineman Escapes..... 524
Electrodes in Sea, Signals Between Air Craft Sent by ..... 278

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Electrolyte, Storage Cell, Float Indicates Level of ..... 136
Electrons in Atom, Scientists Deny Motion of ..... 244
Electroplating Tank, Rotating, for Small Parts ..... 448
Electroscope, Radium in Spring Waters Collapse Gold Leaves of ..... 385
Electro-Therapeutic Set, Handle of Contains Battery ..... 50
Elevated Railroad Trains in Rear End Collision ..... 731
Elevator, Concrete, Explosion of Wrecks Steamer ..... 664
Elevator, Crushed Stone Unloaded with .... 763
Elevator for Saw Frame ..... 933
Elevator Garage, Autos Stored in Tiers in .. 567
Elevator, Grain, Fire Danger in Shown by Model ..... 735
Elevator, Grain Handled Expeditiously in .. 539
Elevator, Grain, Scenic Observatory in Tower of ..... 900
Elevator, Passenger Coaches Lifted from Tracks by ..... 565
Elevator, Phosphate Loading, Tampa, Fla., Has Fastest ..... 389
Elevator, Wheat Header, Gasoline Engine Operates ..... 365
Elevators, Grain, Farmers' Associations Use Concrete to Build ..... 209
Emblem, American Legion Offers Prizes for. 266
Emblem for Lodge, Jewels Cover ..... 405
Emblem, German, One-Headed Eagle on .... 868
Embroidery Hoop and Mosquito Netting, Flower Holder Made from ..... 152
Embroidery Hoops, Tray Made from ..... 793
Embroidery Machine ..... 915
Emery Cloth, Typewriter Platen Smoothed by ..... 953
Emery Wheel Guard, Tire Casing Forms .... 288
Emery Wheel, Power Driven, Motorcycle Tool Shop Has ..... 217
Emery Wheel, Sewing Machine Fitted with 630
Employes, Bank Accounts Established to Pay ..... 216
Employes, Big Dwelling for ..... 873
Employment Program, Nation's Support Promised for ..... 119
Enamel Ware, Leaks Repaired in ..... 462
Engagement Reminder for Desk ..... 449
Engine, Aeroplane, Factory Owner Uses as Ordinary Power Unit ..... 676
Engine and Compressor, Park Trees Sprayed with ..... 701
Engine and Passenger Coach Combined .... 498
Engine, Auto, Curious Boat Driven by .... 541
Engine, Auto, Device Stops When Oil Runs Low ..... 442
Engine, Demonstrating, Auto Salesman's Car Equipped with ..... 396
Engine, Dynamo, and Motor in German Train Drive ..... 7
Engine, Electric Model ..... 948
Engine, Gasoline and Steam Drive ..... 254
Engine, Gasoline, for Airplanes ..... 673
Engine, Gasoline, of Stamped Sheet Steel ...439
Engine, Gasoline, Water Pumped for Irrigation by ..... 718
Engine, "Napier 12," British Airplanes Motored by ..... 332
Engine on Trailer, Motor Truck Hauls ...94, 539
Engine, 1,000 Horsepower, for Aeroplane .... 489
Engine Pistons, Tool for Fitting ..... 778
Engine, Railroad, Air Propels ..... 913
Engine, Steam, Solar Heat Runs ..... 795
Engine Supercharger, Airplane Altitude Mark Set by ..... 898
Engine Supercharger, Record Flight Made Possible by ..... 519
Engine, Turbine, Is Size of Pinhead ..... 71
Engine Valves, Rolling Files in Tool Grind. 16
Engineers, American Army, Build Pontoon Bridge Across Rhine ..... 716
Engineers, Moving Mountain Checked by, by H. E. Thomas ..... 805
Engines, Aeroplane, Muffler for ..... 857
Engines, Gas, Conserving Batteries of ..... 450
Engines, Gas, Theory Learned from Dissected Motors ..... 838
Engines, Radial, for Aeroplanes, Have Nine and Fourteen Cylinders ..... 188
Engines, Railroad, Central Drying House Supplies Sand to ..... 905
Engines, Unbalanced, Concrete Road Tamped with ..... 406
Envelope, Paper, Handle and Flap Fastener on ..... 698
Envelopes, Hotel Provides for Guests' Valuables ..... 762
Envelopes, Stamped, Legend on ..... 881
Eraser for Ink, Three Edge ..... 604
Erosion of River Bed, Jetties Stop ..... 814
Erosion of River Channel, Board Floor Stops 682
Erosion of Soil, Terracing Machine Prevents 57
Essay on Foreign Relations, Prize Offered for ..... 418
Essays on Artillery Subjects, Prizes Offered for ..... 800
Etching Process, New, Steel Impurities Revealed by ..... 190
Ethnology, Bureau of, Archæological Survey of Texas by ..... 170
Evaporator, Fruit, Discharged Soldiers Use 716
Evaporator, Steam, Apple Cider Made into Jelly by ..... 363
Excavating Contractors Use Bunkers to Keep Shovels Working ..... 736
Expansive Bit, Boring Large Hole with ..... 934
Experiment Station, Wild Life, Japan Plans 864
Explorer, North Pole Sought by ..... 741
Explorers, Arctic, on Floe for Five Months. 512
Explorers in Rowboats, Arctic Storm Braved by ..... 858
Explosion in Starch Plant, Death and Ruin Wrought by ..... 201
Explosion, Millions Lost in ..... 844
Explosion, Miners in Tunnel Killed by ..... 395
Explosion of Concrete Elevator, Steamer Wrecked by ..... 664
Explosion of Dirigible, Houses Shaken by .. 426
Explosion of Fertilizing Cartridge, Soil Impregnated with Nitrates by ..... 282
Explosion, Windows Spared but House Damaged by ..... 678
Explosions, Campaign for Prevention of .... 424
Explosions in Empty Automobile Gasoline Tanks ..... 781
Explosions, Oil Plant Fire Spread by ..... 46
Explosives—Bombs, Police to Examine with X-Rays ..... 552
Explosives—Detonators Scattered for Safety 556
Explosives, Dye Industry Necessary to Manufacture of ..... 863
Explosives, Sounding of Ocean with ..... 726
Exports—Cream for Exportation, Danish Machine Preserves ..... 838
Exposition, Aeronautical, Holland to Hold .. 228
Exposition, War Work Shown at ..... 210
Express Line, Motor Truck, Boon to Farmers 213
Extinguisher, Fire, Production of Chemical for ..... 726
Extinguisher, Fire, Sawdust and Soda Used as ..... 770
Eye, Light Removes Particles from ..... 931
Eye Protector, Windshield, for Autoists ..... 712
Eyeglasses, Broken, Cementing ..... 636
Eyes of Forest Rangers, Shield Protects from Mountain Glare ..... 55

Fabric Tests, Government, Prove Dependable ..... 352
Face Protector for Motorcyclist ..... 944
Factories, Electric Thermometers for ..... 746
Factories, Toy, Japanese Children Work in .. 761
Factories, Windows in, Prevent Accidents .. 739
Factory Building, Four Wings on ..... 906
Factory Chimney Gases, Illness Caused by .. 656
Factory Clock, Hands Made Wide on ..... 159
Factory Employes, Venders Sell Milk to ..... 412
Factory, Improved Sewing Machines for ..... 897
Factory Lift Doors, Unusual Type ..... 253
Factory, Overhead Coat Hanger for ..... 125
Fair, Leipsic, Novel Advertising Used at .... 185
Faker, Balloons Inflated with Gas Tank by. 853
Fan, Electric, Is Ventilator and Deodorizer. 434
Fan, Electric, Sign Displayed by ..... 941
Fan, Electric, Voltage Regulator Allows Universal Use of ..... 342
Fan, Fountain Pen and Cards Make ..... 306
Fan on Lathe, Chips Blown Away by ..... 156
Fan, Palm Leaf, Flowers and Ribbon Trim .. 594

Digitized by Google

Fan, Perfume for Air of Rooms Distributed by ..... 312
Fan, Water Power, for Hot Days..... 317
Fans, Motor Drives Row of..... 449
Farm Gate, Hog Proof, Allows Passage of Horses ..... 620
Farm Gate, Rollers Operate..... 445
Farm, Government, Crossbreeding Experiments Made on, by R. H. Moulton..... 562
Farm—Hay Crane, Barn Space Utilized with Aid of ..... 293
Farm Implements, Shelters Lacking for..... 529
Farm Land Timber, Russian, Large Caliber Shells Clear ..... 340
Farm Problems, Britain Encourages Investigation of ..... 334
Farm Products, Novel Signboard Advertises 544
Farm, Simple Bridges for..... 446
Farm, Steel Plowshare as Dinner Bell for.. 462
Farm Tractor, Homemade..... 289
Farm Truck Has Appliances for Handling Fertilizer ..... 364
Farmer, Little Threshing Machine Boon to.. 348
Farmers' Associations, Concrete Grain Elevators Built by..... 209
Farmhouse Electric Lighting System, Portable Bungalow Demonstrates..... 245
Farmstead, Engineering Plan Used to Lay Out ..... 480
Faucet Handle, Door Knob Used as..... 785
Faucet Rack, Movable, in Sea Food Plant... 536
Feathers, Flowers Made of..... 264
Feathers, Toy Aeroplane Glider Made with. 784
Fellowships, Industrial, Idea Grows..... 602
Felt Hats, Wick, Made of..... 950
Fence, Concrete and Chain, Tractors Kept in Field by..... 810
Fence, Flooring of Street Cars Used to Build 111
Fence Posts, Concrete, Hole in Ground Molds 278
Fence Reinforcement, Bull's Charge Broken by ..... 140
Fence, Snowdrifts Prevented by..... 924
Fence, Wall Pocket for Flowers on..... 464
Fences, Southwest, Nature's Barbed Wire Used for ..... 92
Fences, Wing, Power House Protected from Rock Slides by..... 418
Fences, Wire, Tighteners Built in Corner Posts of ..... 536
Fenders and Body of Auto, Removing Dents from ..... 290
Ferryboat, Automobile Backs into River Off of ..... 332
Fertilizer, Farm Truck Has Appliances for Handling ..... 364
Fertilizer, Michigan Lakes Pumped Out for. 486
Fertilizer—Seal Bones, Fossil, on Pribilof Islands Hauled by Tractors..... 70
Fertilizer Used in Spraying Solution..... 568
Fertilizing Cartridge, Orchard Trees Grow in Soil Broken by..... 282
Fever Thermometers, Restoring Graduations on ..... 454
Fever—Typhus in Poland, Drastic Orders to Prevent Spread of..... 598
Fever, Yellow, Sanitation Frees World from 802
Fiber Board, Ink Bottle Holder Made of.... 816
Field Kitchen, Army, Boy "Hikers" Served Meals by ..... 236
Field, Steam Cookers in..... 860
File, Chalk Prevents Lead Particles from Sticking to ..... 302
File Cleaner, Nail Used as..... 449
File Cleaner, Rod Used to Make..... 142
File, Coarse, or Wood Rasp, Marble Chipped Off with ..... 288
File, Combination Tool Made from..... 959
File for Bills, Mousetrap Used as..... 459
File for Desk, Adjustable Units for..... 442
File, Knife Sharpening Steel Made from.... 798
File, Nicks in Woodworking Tools Taken Out with ..... 617
File, Three Cornered, on Stick, Leaves Picked Up by..... 622
File, Worn Wire Grip Repaired with..... 787
Files, Rolling, in Engine Tool, Valve Ground with ..... 16
Filing Cabinet Shelf, Drawer Handle Supports ..... 662
Film Clip, Clothespin Used to Make..... 797
Film, Fire Kindled with..... 949
Film, India Ink to Write on..... 315
Film, Moving Picture, Potato Disease Shown by ..... 752
Film, Moving Picture, What Makes It Go Round, by L. D. Lewis..... 683
Film of Bible, Moving Pictures to Have..... 520
Film, Portrait, Draftsman's Erasing Shield Made from ..... 959
Film Spools, Window Sign Holders Made from ..... 147
Films, How to Keep Pliable..... 614
Filter Material for Chemicals, Wool Displaces Cotton as..... 539
Filters, Oil, for Garage..... 296
Finder, New, Camera Fitted with..... 648
Finger Code, Secret, Big League Catcher Reveals ..... 193
Finger Tips, Radiation from Declared a Fact 68
Fingers of Musicians, Form Rests Make Flexible ..... 595
Fire Alarm, Fuse Controls Mechanism of.. 746
Fire Alarm Gong Hammer, Electric Motor Operates ..... 720
Fire Alarm with Selenium Cell, Light of Flames Operates ..... 224
Fire Basket, Caterpillars Killed with..... 151
Fire—Brick Wall, Heat from Burning Hay Melts ..... 272
Fire Bucket Compartment for Fire Smothering Liquids ..... 434
Fire Bucket, Sign Prevents Misuse of..... 931
Fire by Friction, Logs in Chute Cause..... 892
Fire Claims, Spark Arresters on Locomotives Reduce ..... 44
Fire Danger in Elevator, Model Shows..... 753
Fire Department, Gas Company's Trucks Aid 546
Fire Department, Wrecking Truck for..... 911
Fire Engine, Motor, Rotary Pump for..... 582
Fire Escape—Metal Chute for Infants' Home 566
Fire Extinguisher, Production of Chemical for ..... 726
Fire, Film for Kindling..... 949
Fire, Forest, Angeles National Forest Threatened by ..... 844
Fire Fountain, Chemical..... 950
Fire from Lightning, Oil Tank Destroyed by 704
Fire—Gas Well, Blazing Torch from..... 689
Fire—Gasoline Boat Explodes..... 858
Fire Hose, Collapsed, Machine Belt Made of. 284
Fire Hydrants, Riots in Mill Quelled by Using ..... 99
Fire in American Camps, Railroad Speeders Quench ..... 241
Fire in Coal Pile, Portable Belt Conveyors Used to Fight..... 677
Fire in Coal Pits, Long Pipe Nozzle for Fighting ..... 394
Fire in Inflammable Goods, Wireless may Cause ..... 223
Fire in Mobile, Ala., Wooden Houses Destroyed by ..... 257
Fire Kindler, Asbestos Used to Make..... 150
Fire, New York's Greatest, Blazing Oil Tanks Feature of..... 650
Fire Observation Tower Is High Point..... 425
Fire, Oil Plant in Arizona Destroyed by.... 46
Fire Pictures, Making..... 307
Fire Protection, Forest, Fields Receive..... 272
Fire Rangers, Shield for Eyes of..... 55
Fire Sale, Record Construction of Building for ..... 839
Fire, Sawdust and Soda Used to Extinguish. 770
Fire Screen for Grates..... 777
Fire, Spectacular, Tons of Guncotton in..... 535
Fire Truck, Aeroplane Risk Reduced by..... 404
Fire Tug, Auto Plunges onto Deck of..... 884
Fire Tug, Engineer's Salary Saved by Shortening ..... 370
Fire, Unusual, Wagon Load of Hay Burned by ..... 542
Firearms—Rifle, Steel Brush Shot through to Clean ..... 598
Firebreak, Giant, Waterworks of Pasadena to Have ..... 844
Fireman, Phonograph Built by..... 551
Firemen, Nozzle Anchor Does Work of..... 101
Fireplace, Brass Galleon Guards..... 274
Fireplace, Unusual Type of..... 453
Fires, Marine Forests Burned to Lake Surface by ..... 699
Firewood, Motorcycle and Trailer Haul.... 87

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Firewood, Stumps Used as..... 880
Fireworks—Chemical Fire Fountain..... 950
Fireworm, Cranberry Pest, Destroying..... 730
Fish, Aquarium Records Show Long Lives of 664
Fish, Blocks of, Frozen by Low Temperatures Artificially Produced ..... 87
Fish, Boat Collects for Aquarium..... 741
Fish Cleaning Plant, Movable Faucets for.. 536
Fish—Codfish Market, St. John's Is World's Greatest ..... 40
Fish Eggs, Unfertile, Girls Pick Out with Tweezers at Hatcheries..... 720
Fish for Fishermen, Seaplanes to Locate... 802
Fish, Gold, Red, White, and Blue Marks on. 832
Fish, Harmful, Resort Lake Cleared of..... 89
Fish Hatcheries, Flies Bought by..... 557
Fish Industry in Sardinia, Aeroplanes to Promote ..... 322
Fish, Metal, German U-Boats Tracked by... 906
Fish, Mysterious Moss Kills..... 662
Fish, Pasteboard, Oil Propels..... 796
Fish, River Thames Restocked with..... 59
Fish—Salmon, Alaskan, Petition for Protection of Spawning Grounds of..... 65
Fish—Salmon Canneries Built on Scows.... 548
Fish Skins, New Curing Process Makes Leather from ..... 886
Fish—The Lure of the North Pacific, by Lawrence William Pedrose..... 333
Fisherman, Seaplane Used by..... 481
Fisherman's Catch, Turn of Windlass Drains 76
Fishermen, Giant Catfish Caught with Hooks on Poles by..... 272
Fishermen, Halibut in North Pacific Lure of, by Lawrence William Pedrose..... 333
Fishermen, Salmon, Pirates Prey on, by L. W. Pedrose ..... 882
Fishing Boat, Torpedo Boat Made into..... 376
Fishing Boats, Anchors Operated by Pulleys on ..... 313
Fishing, Deep Sea, Seaplane Simplifies..... 481
Fishing Floats, Burned Out Incandescent Globes Used as..... 158
Flag, American, over Coblenz..... 186
Flag Holder, Road Mirror, and Searchlight for Automobiles ..... 755
lag with Map of United States, Mechanic Embroiders on Linen..... 117
agpole, Creosote Protects..... 608
agpole, Pivoted, Repairs Easy on..... 612
lagpole, Steel, Cut off and Spliced..... 270
'lagpole, Steel, Traffic Regulated by..... 588
Flags, Battle, German Rioters Destroy..... 382
Flame Spreader for Kerosene Lamp..... 618
Flashlight Batteries, Outfit Makes When Needed ..... 191
Flashlight Bulb, Electric, for Mending Gloves 153
Flashlight, Metal Strip Makes Dry Cell into 276
Flashlight, Pocket, Dynamo in..... 804
Flatiron, Brass and Leather Cemented with. 766
Flax Seed, Double Size, Limpid White Oil Yielded by ..... 676
Fleet, Pacific, Aerial Photographs of..... 526
Fleet, Pacific, 'Statue of Uncle Sam Welcomes ..... 688
Flexible Steel Oilcan Spouts..... 749
Flies, Fish Hatcheries Buy..... 557
Flies, Kerosene on Cloth in Garbage Can Kills ..... 315
Flight, First Nonstop, Atlantic Spanned by, by Paul A. Jenkins..... 165
Flight Map, U. S. and Canada to Have..... 244
Flight, Pacific, Prize Offered by Moving Picture Producer for..... 218
Float Carrying Shells, Gas Record Shown by 203
Float, Metal, of Carburetor, Testing for Leaks ..... 620
Float, Salvation Army, Doughnuts and Coffee Pot on..... 13
Float, Storage Cell Electrolyte Level Indicated by ..... 136
Floats, Canvas, Army Footbridge Supported by ..... 93
Flood, Concrete Jackets for Poles Insure against ..... 858
Flood Menace, Great Dam Removes ..... 870
Floods, Galveston to be Raised above..... 714
Floods in New Jersey Cities, Heavy Rains Bring ..... 575
Floor Mop, Wheeled Tank Used as..... 705
Floor of Boards, Erosion of River Bed Stopped by ..... 682
Floor Polishing and Scrubbing Machine.... 844
Floor Squeegee Machine, Water Collected by 682
Flour, Potato, Production of..... 903
Flower Basket, Irrigating Can for..... 386
Flower Box Built on Chimney..... 632
Flower Bulbs, Native, Imported Products Displaced by, by R. P. Crawford..... 572
Flower Holder, Embroidery Hoop Used as.. 152
Flower—Hyacinth Bulbs, Two-Color..... 476
Flower Pocket, Fence Supports..... 464
Flowerpot, Vase for Cut Flowers like..... 435
Flowerpots, Concrete, Pails as Molds for.... 124
Flowerpots, Inverted, Garden Platform Made by Placing Planks on..... 133
Flowers, Candle Wax Used to Make..... 631
Flowers, Cut, Lead Ribbon as Holder for.... 477
Flowers, Doll Dress Formed by..... 785
Flowers, Feathers Used to Make..... 264
Flowers—Hyacinth Bulbs Producing..... 611
Flowers in Home Garden, Perfumes Made from ..... 307
Flowers of Century Plant Unnoticed in Deserts ..... 548
Flowers, Paper Shelters for..... 951
Flowers, Paraffin Preserves..... 933
Flowers, Sand Preserves..... 770
Flowers, Ship Sunk as Tribute to Dead is Laden with ..... 405
Flowers, Wild, City Vacant Lots Beautified by ..... 564
Flues in Boiler, Short, Fitting of..... 455
Fly Paper, Guard for..... 473
Fly Paper, How to Make..... 157
Fly Paper, Mice Caught on..... 306
Flying Boat, Lock in Panama Canal Hit by. 58
Flywheel, Auto, Starter, Steel Ring Gear Fits ..... 218
Flywheel, Reversing on Shaft..... 286
Fodder, Corn, Binders..... 764
Fog Signals, Automatic, Lighthouse Wireless Sends ..... 842
Foil, Tin, China Uses Primitive Methods in Making ..... 117
Food, American, Russian Children Do Better with ..... 97
Food Chopper, Trough for..... 953
Food, Cooked, Center, Buffalo, N. Y., Has.... 712
Food for American Lumberjacks in French Forest, "Gravy Trains" Carry..... 250
Food for Men on Influenza Patrol, Camels Carry ..... 265
Food, Heat Units Should Determine Price of. 758
Food, Liquid, Factory Employes Drink Milk as ..... 412
Food Preservation, Vacuum Process of Dehydration for ..... 247
Food, Preserved, Argentina Tests Imports of 876
Foot Power Automobiles, Europeans Use.... 809
Foot Scraper, Scrap Iron Makes..... 955
Foot Strengthening Device, Three Purposes Served by ..... 758
Foot Throttle, Automobile, Aluminum Pedal Operates ..... 752
Foot Warmer for Navy Men, Electric Hot Plate Is ..... 277
Football, Aeroplane Hangar Inflates like... 653
Footbridge, Army, Canvas Floats Support.. 93
Footbridge, Travelers Carried over Water Front Traffic by..... 77
Forage Plant, Kudzu Grown as..... 104
Ford, River, Concrete Dam Top Used as.... 496
Forest Biological Station to be Memorial to Roosevelt ..... 255
Forest Fire Protection, Fields Receive..... 212
Forest Fire, Volunteers Control..... 844
Forest Preserve, Chicago's, Made Ready for Visitors ..... 162
Forest Rangers' Eyes, Shield Protects from Mountain Glare ..... 55
Forest Rangers, Plant Specimens Collected by ..... 835
Forest Service, Trail over White Mountains Built by ..... 652
Foresters, American, Steam Skidding Machine Erected in France by..... 108
Forests, Marine, Burn to Lake Surface..... 699
Forests, National, Postmark Advertising Used for ..... 342
Forests—Timber Supply, Britain's, to be Replenished ..... 218
Forests—Wood Pulp Valued by Aeroplanes during Surveying ..... 340


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Forge Hammer, Steam, Largest in U. S..... 270
Fork, Mechanical, for Hay Barn..... 293
Formic Acid, Bees' Stings Used to Make, by Sam E. Conner..... 355
Formulas, Electrical, Diagram Facilitates Remembering ..... 296
Fort, Bank Guard Stands Watch in..... 497
Fortress, Ancient, in New York Harbor, Military Offenders Caged in..... 271
Fortress, Old, Rock Pillar in Ceylon Is..... 825
Fossil Egg of Æpyornis..... 108
Fossil Seal Bones, Tractors Go to Pribilof Islands to Haul..... 70
Fountain Brush, Many Uses for..... 595
Fountain, Drinking, Germ Free..... 802
Fountain, Drinking, Horses in Pasadena Provided with ..... 589
Fountain Pen and Cards, Fan Made of..... 306
Fountain Pen, Bottomless Pocket for..... 464
Fountain Pen, Double Point..... 442
Fountain Pen, Illuminated, Battery in..... 888
Fountain Pen, Soldering Copper Made like.. 767
Fountain Pen Wrench, Wet Paper for..... 636
Fountain, Small, Incandescent Lamp Operates ..... 276
Fourth of July, Boy with Broken Arm Celebrates ..... 761
Fourth of July, Water Fight Staged on..... 48
Frames for Pictures, Army Cartridges Used to Make ..... 435
Freight Car Door, Attachment Opens..... 834
Freight Containers, Steel, for Boats and Cars 574
Friction, Wagon Load of Hay Fired by..... 542
Frost, Water Pipe Protected from..... 939
Fruit, Apple Tree Yields 36 Varieties of..... 888
Fruit Bottle Tray, Boiler Bottom Supports.. 275
Fruit Canning—Mason Jars in Hot Water, Tongs for Handling..... 275
Fruit Closet, Ventilated, Waste Space Utilized by ..... 373
Fruit Drying Machine, Waste Saved by..... 843
Fruit Drying Outfit, Compact, Discharged Soldiers Use ..... 716
Fruit Growers, Steam Cider Evaporator, Convenience for ..... 363
Fruit Jar, Toothbrush Rack and Sterilizer Made of ..... 474
Fruit Juice Extractor, Electric..... 904
Fruit Pickers and Painters, Hooks and Boxes on Ladder Aid to..... 450
Fruit, Picking and Packing of..... 294
Fruit, Preventing Bruising of..... 467
Fruit, Self-Supporting Ladder Useful in Picking ..... 135
Fruit Trees, Cañon Home of..... 428
Fruit Trees, French in War Swept Territory Replanting ..... 252
Fruit Trees, Rake for Cultivation of..... 138
Fruits and Grains, Crossbred, Are Disease Proof, by R. H. Moulton..... 562
Fruits, Dried, Corn Popper Used to Wash... 925
Fruits, Giant, Iron Sulphate Treatment Aids in Growing ..... 142
Fuel, Heavy, for Trucks and Tractors, Preparation of ..... 918
Fuel, Peddlers in Spanish Cities Sell Pine Cones for ..... 349
Fuel Wagons, Seagoing, Naval Air Station Equipped with ..... 583
Fuel, Waste Coal Mine Silt Now Worked for 412
Fulcrum Attachment for Snow Shovel..... 957
Funeral, Aerial, Aeroplane Serves as Hearse at ..... 667
Funeral, Aeroplane Suggested as Hearse for 486
Funeral Plane, Flower Laden, Bees Follow. 509
Funeral, Public, Belgian Martyrs Honored with ..... 368
Funnel and Pail, Combined, for Boat..... 313
Funnel, Oilcan Used to Make. ..... 769
Funnel, Strainer, Measure, Combination Flexible Nozzle Oilcan Is..... 439
Funnels, Paper, Are Grease Gun Substitutes 782
Fur Muff, Curved, for Children..... 275
Furnace, "Don'ts" for..... 934
Furnace, Electric, Hearth Forms One Electrode of ..... 917
Furnace, Gas, Exhaust Heat Stored by..... 439
Furnace, Oil Burning, Heating Expenses Reduced by ..... 437
Furnace, Warming Oven in..... 945
Furnaces, Electric, Resistance Wire Used in 768
Furnaces, Metal Working, Hand Operated Gas Reversing Valve for..... 394
Furnaces, Pyrometer Keeps Records of Ten. 414
Furniture, Antique Mahogany ..... 933
Furniture, Antique, Remarkable Violins Made from ..... 670
Furniture—Chair, Convertible, Stepladder and Ironing Board Made of..... 434
Furniture—Chair Rungs, Steel Ring Prevents Slipping Out of..... 123
Furniture—Desk and Chair Combined..... 162
Furniture, Doll's, Steel Used to Make..... 920
Furniture—Dresser, Old-Fashioned, Modernizing ..... 607
Furniture—Leg of Rustic Table, Sprouts Grown on ..... 101
Furniture—Library and Writing Desk Combined ..... 755
Furniture—Mirror, Rigid Frame, Changing to Tilting Type..... 295
Furniture—Pocketknife Used to Carve Combination of Pieces..... 748
Furniture, Rubber Bands Used in Gluing.... 792
Furniture, Shoe Polish for Refinishing..... 466
Furniture—Sofa, Phonograph under Arm of. 754
Furniture—Table, Convertible, Has Three Different Uses ..... 765
Furniture—Table, Top of Arranged for Reduction in Size..... 754
Fuse, Fire Alarm Mechanism Controlled by. 746
Fuse Wire, Method of Making..... 473

Galleon, Brass, Fireplace Guard Is..... 274
Gallows, Artists' Model Hoisted by..... 803
Gambling House Doors, Coast City Police Collect ..... 32
Game—Blocks, Jumping, Paddle Used to Move ..... 69
Game Rules, Bridge, in Rime..... 800
Games—Chess Player, Expert, Forty against 834
Games, Outdoor, Harvard University Students Compelled to Participate in..... 698
Gang Drill, Sliding Head, Has High Speed.. 190
Gangway Doors, Locked, Trespassers on Railroad Property Roofs Barred by..... 396
Garage, Air Nozzle for Removing Carbon Used in ..... 779
Garage, Automobile Headlights Used to Light ..... 140
Garage Door, Latch for..... 287
Garage Elevators, Automobiles Stored in.. 567
Garage, Folding Doors for..... 923
Garage for Motorcycle, Box Used to Make... 455
Garage Hoist, Portable, Pipes and Fittings Used to Make..... 781
Garage Hotel, Driveways to Three Floors of 690
Garage, L-Shaped, Two Cars Use Single Door In ..... 827
Garage, Roof Garden and Pergola on..... 110
Garage Tool, New, Clamp for Ball Races is. 417
Garages, Automobile Tire Last for..... 756
Garbage Can Chained to Box in Fence..... 152
Garbage Can, Kerosene Kills Flies in..... 315
Garbage Incinerator for Destroying Code Books, Navy Department Uses..... 576
Garbage, Sea Sand Aids Coast City in Disposing of ..... 363
Garden, Botanical, in Versailles, Proposed Plan for ..... 578
Garden Entrance, Logs of Concrete Fashion. 111
Garden Hose, Bicycle Handlebar Grips Made of ..... 631
Garden Platform, Planks on Inverted Flowerpots Form ..... 133
Garden Seat and Outdoor Bed, Spring Couch Used for ..... 447
Garden Seat of Buggy Seat, Stump Supports 465
Garden, Strange, Cañon's Cliffs Scaled to Enter ..... 428
Garden, Toy, Real Plants in..... 946
Garden Tractor Cultivator, Students Build.. 280
Garden Trellis, Adjustable..... 126
Gardener, Truck, Glasshouse on Wheels Convenience for ..... 454
Garment Hanger, Overhead, Factory Uses... 126
Garter Claps for Towel Hangers..... 157
Gas By-Pass, Stopcock for Liquids Has..... 437
Gas, Carbon Bisulphide, Field Rodents Killed with ..... 771
Gas, Carbon Monoxide Absorbent Makes Army Masks Proof Against..... 584

Gas Cloud on Sun, Enormous, Astronomers Observing ..... 200
Gas Company Trucks, Fire Department Aided by ..... 546
Gas Connection, Elastic, Seamless Copper Tubing for ..... 222
Gas Engine Theory, Dissected Engines Teach ..... 838
Gas Engines, Stationary, Conserving Batteries of ..... 450
Gas, Expanding, Oil Well Capped with Ice by Refrigerating Action of ..... 555
Gas Furnace, Exhaust Heat Stored by ..... 439
Gas in Ship's Hold, Rescue of Victims of ... 692
Gas, Inflammable, Instruments Detect Minute Quantities of ..... 728
Gas, Kerosene Burner Generates ..... 115
Gas Leakage in Mines, Chemical Odors as Warning Signals of ..... 386
Gas Mask, Army, Woman Wears While Peeling Onions ..... 902
Gas Mask Test, War Veteran Asphyxiated in ..... 912
Gas Masks, Army, Made Proof against Absorption ..... 584
Gas Measuring Device, Meters Calibrated with ..... 696
Gas, Oil, Roaring Torch of ..... 689
Gas Oven, Device Controls Gas Supply of .. 434
Gas Poisoning, Automobile Exhaust, First Aid Treatment for ..... 717
Gas Record, Shells on Float Show ..... 203
Gas Reversing Valve, Hand Operated, for Metal Working Furnaces ..... 394
Gas Stove Bread Toaster ..... 755
Gas Tank, Faker Inflates Balloons with .... 853
Gas Tank, Sea Plane Crashes into ..... 28
Gas Tanks, Barge Rafts Carry Upstream .... 70
Gases for War Use, Goats Used in Testing .. 503
Gases from Factory Chimney, Illness Caused by ..... 656
Gases, War, Dye Industry Necessary to Manufacture of ..... 863
Gaskets, Asbestos, for Auto Exhaust Pipe, Securing ..... 292
Gaskets, Rubber, Old Tires Used to Make ... 791
Gasoline and Steam Driven Engine ..... 254
Gasoline Boat, Engine Back Fire Causes Explosion of ..... 858
Gasoline, Burning, on Pile of Sand, as Light for Tire Repairs ..... 611
Gasoline Engine of Stamped Sheet Steel .... 439
Gasoline Engine Pistons, Tool for Fitting ... 778
Gasoline Engine, Water Pumped by for Irrigation ..... 718
Gasoline Engine, Wheat Head Elevator Operated by ..... 365
Gasoline in Tank, Siphon for Starting Flow of ..... 452
Gasoline Motor, Automobile, Street Car Trailer Propelled by ..... 750
Gasoline Motors, Wood Burning Engines Supplanted by ..... 568
Gasoline or Kerosene, Nickelplate Polished with ..... 310
Gasoline, Plugged Up Sink or Drain Pipe Cleaned with ..... 447
Gasoline Power Plant for Aerial Use ..... 673
Gasoline Sprayer, Metal Parts Cleaned with 940
Gasoline Stove for Camp, Folding ..... 634
Gasoline Tank, Cylindrical, Spare Tires Carried on ..... 736
Gasoline Tank Leak, Soap Plugs Up ..... 952
Gasoline Tank on Motorboat, Trap to Catch Dirt in Feed Line ..... 295
Gasoline Tank Trucks, Aeroplanes Supplied by ..... 231
Gasoline Tanks, Empty, Explosions in ..... 781
Gasoline Tubing, Punch and Die for Flaring 141
Gate for Farm, Rollers Operate ..... 445
Gate, Hog Proof, Allows Passage of Horses 620
Gate, Long Hinge Bolt Secures ..... 612
Gate, Self-Closing, Nonsagging ..... 615
Gates, Auto, Are Animal Proof ..... 603
Gates, Old Metal Beds Used to Make ..... 145
Gates, Semiautomatic, Lake Merritt Level Regulated by, by C. W. Geiger ..... 729
Gateway, Cemetery, Outlasts Adobe Wall ... 724
Gateway, Park, Cheap Lumber Used for .... 297
Gateway, "Torii," Florida Home Has ..... 110
Gauge, Carpenters', Setscrew Not Required on ..... 764
Gauge, Cylinder Diameter ..... 767
Gauge Glasses, Avoiding Breakage of ..... 457
Gauge, Pressure, and Tire Spreader for Auto 926
Gauge, Radius, for Draftsmen ..... 772
Gauge, Rain, Weekly Record Written by ... 895
Gauge, Test, for Lathe Centers ..... 292
Gauge, Tire Pressure, on Air Compressor ... 616
Gauntlet, Hole in Exposes Face of Wrist Watch ..... 784
Gauze Steel, Lead Reinforced with ..... 602
Gear Cutting, Lathe Used for ..... 776
Gear Lever Handle, Chewing Gum Used to Repair ..... 797
Gear, Steel Ring Starter Fits Auto Flywheel ..... 218
Gears, Spur, Machine with Adjustable Hob Spindle Cuts ..... 426
Geiger, C. W.:
Lake Merritt, Improvements on Shores of. 729
Gelatin, Treated, Cellulose Substitute Made from ..... 561
Gem—White Zircons Proposed as Diamond Substitute ..... 523
Generating Plant, Portable, Stump Drills Driven by ..... 52
Geologists Estimate Age of Ocean at 90,000,000 Years ..... 717
Geometric Lathe, Plates for Mexican Money to be Made by ..... 279
Geophone, Trapped Miners Rescued with Aid of ..... 2
Germ of Influenza, Scientists Search for .... 908
Germs in Liquid Food, Hydraulic Press Kills ..... 577
Giraffe, Stubborn, Carried to Winter Quarters ..... 840
Girders, Concrete, Roof of Panama Pier Has 832
Girl, Hawaiian, Water Carried in Bamboo Log by ..... 760
Girls, Filipino, as Bus Conductors ..... 197
Girls, Infertile Fish Eggs Picked Out at Hatcheries by ..... 720
Glass Bottom Boats, Advertisement on Ocean Bed Seen Through ..... 593
Glass Cover for Orange or Grape Fruit ..... 754
Glass Cutter, Cheap, Dipped in Kerosene, Straight Work Done with ..... 291
Glass Decorations, Artistic, Crêpe Paper Used for ..... 467
Glass Headed Push Pin, Student Carries for Coat Hook ..... 152
Glass House on Wheels Convenience for Nurseryman ..... 454
Glass, Ink Used to Draw on ..... 299
Glass Insulators, Insects Kept from Refrigerators by Using ..... 132
Glass, Inverted, on Fixture, Toothbrushes Protected by ..... 594
Glass Lemonade Spoons, Hollow Handles Serve as Straws on ..... 594
Glass, Mineral Waters of Bath Used to Tint. 198
Glass of "Tower of Jewels" in Greenhouse Dome ..... 586
Glass, Optical, is Easily Dented or Corroded ..... 919
Glass, Putty Removed from with Hydrochloric or Nitric Acid ..... 773
Glass, Shears Cut ..... 779
Glass, Slate Waste of North Wales to be Made into ..... 668
Glass Sounding Board, Church Auditorium Fitted with ..... 558
Glass Splitter, Electric, Heated Ribbon Used on ..... 599
Glass, Theater on Roof Walled with ..... 522
Glazing Device, Greenhouse Roof Waterproofed with ..... 670
Glider, Toy Aeroplane, Feathers Used to Make ..... 784
Globe Circling Flight by Magellan of the Air, World Awaits, by Paul A. Jenkins .... 350
Globes, Electric Light, as Targets ..... 477
Glove, Hole in Exposes Face of Wrist Watch ..... 784
Glove Snap Button, Repairing ..... 145
Gloves, Lamp Bulb Used in Mending ..... 153
Glue Bottle Stopper, Lard on Prevents Sticking ..... 936
Glue, Casein on Aeroplanes, Rats Devour .... 65
Glue, Viscosity Indicates Strength of ..... 99
Goat, Milk, Back Yard Stall for ..... 255

Digitized by Google

Goat Skin, Tanned, Valued According to Weight ..... 752
Goats, War Gases Tested on..... 503
Gocart, Books Delivered in Hospitals with.. 196
Gold and Other Minerals in Siberia..... 30
Gold Mining District, Drainage Tunnel Unwaters, by J. E. Murphy..... 742
Gold Penholder, Schoolgirls Give French Premier ..... 220
Goldfish, Red, White, and Blue Marks on... 832
Golf Ball Trade of Caddies, Sign Stops..... 372
Golf Club Head, Lignum Vitæ Used to Make. 662
Golf Clubs, Loops Inside Mouth of Bag Protect ..... 475
Golf, Indoor, for Winter..... 947
Golf—Indoor Hole Makes Any Carpet a Putting Green ..... 4
Golf Links Grass Mower, Motor Cultivator Used to Make..... 329
Golf Practice, Canvas Backstop for..... 652
Gong Fire Alarm, Fuse Controls Mechanism of ..... 746
Goodwin, W. F.:
New York Diagnostic Clinic..... 865
Gorget, Copper, Unearthed Mound Builder's Tomb Discloses ..... 688
Government, City Waste Reclamation Encouraged by ..... 497
Government, Coal Yard in City of Washington Operated by..... 53
Government, Word Registered under Own Trade-Mark Laws by..... 583
Grade Crossing Plan, Safety Turnouts for Roads Is ..... 117
Grade Crossing, Railroad, Warning Sign for 910
Grade, Two-to-Three, Truck Started and Stopped on ..... 540
Grafting—Apple Tree, 36 Varieties of Fruit from ..... 888
Grain Dust Explosions, Campaign for Prevention of ..... 424
Grain, Elevator Equipped to Handle Quantities of ..... 539
Grain Elevator, Millions Lost by Explosion in ..... 844
Grain Elevator, Model, Fire Danger Shown by ..... 753
Grain Elevator, Scenic Observatory in Tower of ..... 900
Grain Elevators, Concrete, Farmers' Associations Build ..... 209
Grain, Machine Measures Moisture in..... 510
Grains and Fruits, Crossbred, Are Disease Proof, by R. H. Moulton..... 562
Granite, Modern Stone Cutter Slices..... 412
Granite Quarry in California, Nation Supplied by ..... 881
Grape Fruit or Orange Cover, Glass..... 754
Grass Mat for Gardener..... 611
Grass Mower for Golf Links, Motor Cultivator Used to Make..... 329
Grass Mowing Race, Arguments Over Lawns Ended by ..... 424
Grasshoppers, Trap Rollers Crush..... 677
Grate Fire Screen, Inexpensive..... 777
Grave of Indian Chief, Totem Guards..... 91
Gravity, Humane Animal Muzzle Operated by ..... 197
Grease and Dirt, Sandpaper Removes from Carborundum Wheel ..... 765
Grease Gun, Automobile, Paper Makes Substitute for ..... 782
Grease Gun, Cement Applied with..... 775
Grease Guns, Flexible Steel Spouts for.... 749
Grease on Machine Belts, Kitchen Scouring Powder Cleans ..... 155
Grease on Rear Axles of Auto, Removing.. 605
Greenhouse Dome, "Tower of Jewels" Glass in ..... 586
Greenhouse Glazing Device, One Hand Operates ..... 670
Greenhouse, Largest Hotel Topped by..... 321
Greenhouse on Wheels..... 454
Greenhouses, Southern Swamps Furnish Lizards for ..... 724
Griddle and Broiler Combined..... 754
Grinder, Fixture Changes Shaper to..... 927
Grinder, Portable, for Machine Shop..... 528
Grinder, Sewing Machine Fitted with..... 630
Grindstone, Circular, Oilstone Used to Make 785
Grip, Wire, Repair of..... 787
Grocery Delivery Truck, Movable Partition for ..... 765
Grocery Store, Circulating, Customers Called on by ..... 260
Grub—Corn Borer, Liquid Fire and Steam Used to Kill..... 585
Guard Above Circular Saw, Workmen's Fingers Saved by ..... 257
Guard Converts Ordinary Razor into Safety Razor ..... 765
Guard for Emery Wheel, Tire Casing Forms 288
Guard for Left Front Wheel of Automobile. 782
Guard for Watch Pocket..... 274
Guards, Saw and Ax Protected by..... 936
Guilds, Venice, Coffer Given to New York City by ..... 28
Gum, Chewing, Gear Lever Handle Repaired with ..... 797
Gum Tree, Domestic, Substance Produced by Is Substitute for Storax..... 746
Gun, Aeroplane, Universal Bearing Holds... 759
Gun Barrel, Fusible Metal Used to Stop Fouling of ..... 167
Gun Carriage, Railroad, Service Test of.... 511
Gun Cotton, Fire Burns Tons of..... 535
Gun Discharge, Soot in Chimney Dislodged by ..... 462
Gun, German, Connecticut and Massachusetts Both Claim..... 65
Gun Hammer, Gunpowder Used by Railroad to Operate ..... 430
Gun, Liner Shrunk into Place in Making.. 30
Gun, Machine, Spring Operated ..... 966
Gun, Naval, Britain Fires World's Largest Shell in ..... 216
"Gun," Orchestra, Foot Pressure Shoots.... 249
Gun, Rope Used to Clean..... 475
Gun Steel, Electric Furnace Shortens Making of ..... 224
Gunnery—Why Shooting Downward Is Difficult ..... 954
Gunpowder to Operate Gun Hammer, Railroad Uses ..... 430
Guns, Coast, Aerial Observers Adjust Fire of 336
Guns, Four-Inch, Warship Destroys Icebergs with ..... 672
Guns, Heavy, Endless Tread Tractors Mount ..... 31
Guns, Long Distance, Lack Practical Value. 564
Gypsum, Cement for Marine Work Should Contain ..... 77

Hacksaw Blade, Mirror on..... 452
Hacksaw, Cutting Square Holes with..... 620
Hair Curler of Aluminum Wire..... 435
Halibut, Fishermen Lured to North Pacific to Harvest, by Lawrence William Pedrose ..... 333
Halibut Trawler Made of Torpedo Boat..... 376
Hall, Nassau, at Princeton, Remodeled as War Memorial ..... 236
Hall Rack for Children's Clothes..... 150
Hammer and Rule Trick..... 958
Hammer, Fire Alarm Gong, Electric Motor Operates ..... 720
Hammer Handle, Slipping of Prevented by Grooves ..... 773
Hammer Handles, Wedges for..... 455
Hammer Head, Rubber Crutch Tip Fitted on 777
Hammer, Soft Metal, Handle for..... 937
Hammer, Steam Forge, Largest in U. S..... 270
Hammer, Steam, Overhead Cable Used to Move ..... 735
Hammer, Strap Iron Used to Make..... 156
Hammer, Woodwork Protected by Rubber Band on ..... 453
Hammerhead Crane, Shipways Served by... 266
Hammers, Pneumatic, Concrete Ship Tamped by ..... 325
Hamper, Modern, for Clothes..... 914
Hand, Artificial, Woman Typist Uses..... 520
Hand Bag, Flap Protects Contents of..... 274
Hand Car Swing ..... 308
Hand Grenade Savings Banks, War Department to Give..... 235
Hand, Mechanical, Shoulder Movements Operate ..... 694
Handcuffs, Sailors Cross Continent on Bicycles Tied with..... 253
Handkerchief, Powder Puff Concealed in Pocket in ..... 435

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Handle for Soft Metal Hammer..... 937
Handle, Hammer, Slipping of Prevented by Grooves ..... 773
Handle, Old, String Holder Made of..... 300
Handle, Paint Pots Carried on..... 139
Handle, Suitcase End Fitted with..... 299
Handles, Drawer, Wire Used for..... 124
Hands, French Schools to Teach Use of Both 6
Hangar, Airship, for Atlantic Coast, Navy Plans ..... 557
Hangar and Landing Field, Private, Business Man Owns..... 360
Hangar, Concrete, Is Fireproof..... 203
Hangar for Aeroplane Inflates like Football 553
Hangar Subway, Ring Shaped, for Airships.. 106
Hangars for Seaplanes at Water's Edge.... 547
Hanger, Clothes, Revolving Hook on..... 754
Hanger, Coat, Factory Uses Overhead..... 125
Harbor at Valparaiso, Concrete Works Improve ..... 702
Harbor Development for Suez Canal Terminus ..... 696
Harbor Facilities, Canal in New Orleans Offers ..... 490
Harbor Improvement, New York, Piers Projected in ..... 485
Harbor Improvements, Genoa, Italy, to Make 748
Hardware Stock, State Seals Produced with 695
Harpoons, Explosive, Whales Captured with 397
Harrow and Cultivator Combined..... 109
Harrow, Attachment Saves Time in Cleaning 76
Harrow, Rex:
The Sniper's Bag of Tricks..... 737
Harvester and Thresher, Grain Delivered to Wagons by ..... 425
Harvester, Beet, Motor Digs, Tops, and Loads 871
Harvester of Clover Seed, Ripe Heads Only Picked by ..... 687
Harvester of Cotton, Vacuum System Used by ..... 695
Harvester, Walnut, Device Used as..... 902
Harvesting Machines, Tractor Operated..... 365
Hasp, Strap Hinge Used as..... 941
Hat Hook, U-Shaped Guard on ..... 435
Hat, Lady's, Hook of Wire for..... 286
Hat, Tin, of Vikings, Lake Bottom in Sweden Yields ..... 55
Hatcheries, Fish, Girls Pick Out Infertile Eggs at ..... 720
Hatpin, Guide in New Hat for..... 274
Hats, Felt, Wicks Made of..... 950
Hats, Soft, Preserving Crease in..... 476
Hats, Straw, Shellac Restores Gloss to..... 787
Hay, Burning, Brick Wall Melted by Heat from ..... 272
Hay Crane, Barn Space Utilized with Aid of 293
Hay in Bundles or Loose, Machine Loader Handles ..... 526
Hay on Wagon, Unusual Fire Burns..... 542
Hay Press, Self-Threading, Improvement on 892
Hay Rake, Mules Push before Them..... 176
Head Hold, Wrestler Uses Wooden Dummy to Practice ..... 4
Head of Lincoln, Largest, Artist Models.... 337
Headlights, Auto, Garage Lighted with..... 140
Headlights, Automobile, Shield Protects Driver's Eyes from..... 712
Hearse, Airplane Suggested as..... 486
Hearse, Airplane Used as..... 667
Heat, Cement Coatings Protect Concrete from ..... 504
Heat Coil as Mitten Drier..... 637
Heat, Exhaust, Gas Furnace Stores..... 439
Heat, Oil-Burning Furnace Reduces Cost of Producing ..... 437
Heat—Town Hall in European City Heated with Unusual Hot Water System..... 556
Heels, Slipping Prevented by Corks on..... 959
Helicopter, Whirling Power Plants Lift.... 671
Helmet, Soldier's, Lighting Fixture Made of 828
Helmet, Soldier's, Statue of Liberty Wears.. 872
Helmet, Steel, Lamp Shade Made of..... 466
Helmet, War Record of Fraternity Preserved on ..... 709
Helmets, Huge French, Dugout Porches Roofed by ..... 336
Helmets, Interphone, Airmen of Squadron Equipped with ..... 246
Henhouse, Snake Trapped by China Egg in 406
Henhouses, Discarded Linoleum Used to Weatherproof ..... 779
Hens, Poultry House Door Opened by..... 625
Herder of Sheep, Home of, by Frank R. Arnold ..... 189
Hermaphrodite Calipers, Shoulder on..... 610
Hermit Painter, Seashore Cottage of..... 732
"Hermit," Protest of..... 63
Hides for Leather, Shark Seines Supply.... 674
High Chair, Belt Secures Baby in..... 595
Highway, Concrete, Built in Three Strips.. 676
Highway, Concrete, Huge Roller Assists in Constructing ..... 520
Highway Condition Reports, Weather Bulletins Include ..... 745
Highway Construction Material, Unloader for ..... 763
Highway, Costly, for New York State..... 904
Highway Departments of States, Trucks to be Given to ..... 194
Highway, International, to Connect Americas, Plan for..... 352
Highway, Lincoln, Automobile Traffic on.... 747
Highway, Lincoln, Novel Sign on Warns of Hill ..... 751
Highway, North to South, Minnesota Cities Propose along Mississippi..... 164
Highway Transport Course, College, Many Subjects Included in ..... 516
Highway, Twin Peaks, Landslides Keep Road Workers Busy on..... 87
Highwaymen of the Air, by Lloyd D. Lewis. 41
Highways of the Air, U. S. and Canada to Have Maps of..... 244
Highways, Trunk, Wisconsin Autoists Aided by Signs on..... 52
Highways, Water Maker and Destroyer of.. 232
Hill, Novel Sign on Lincoln Highway Warns Motorists of ..... 751
Hinge Bolt, Long, Gate Held Securely by... 612
Hinge, Butt, Is Window Stop..... 937
Hinge, Die for Use with Hand Punch Formed from ..... 942
Hinge in Beam, Plow Enabled to Jump Obstructions by ..... 592
Hinge, Quickly Made ..... 951
Hinge, Strap, Automobile Lock Made of..... 286
Hinge, Strap, Used as Hasp..... 941
Hinges, Tobacco Cans Used to Make..... 633
Hobbyhorse on Wheels..... 440
Hobbyhorse, Trotting ..... 943
Hoe, Wire, for Garden Use..... 137
Hog Proof Gate Allows Passage of Horses. 620
Hogg, John Edwin:
Rebuilding the Great Otay Dam..... 379
"Steve Brodie" Aeroplane Landings..... 262
Submarine Accident, Extraordinary..... 322
Hogs' Bristles, Brushes Made of..... 631
Hogs, Operating Table for..... 584
Hogs, Portable Scale for Weighing..... 838
Hoist for Auto Truck Dump Bodies, Worm Gear Does Duty as Brake in..... 273
Hoist for Coal Mine, Control for..... 558
Hoist, Portable, Pipes and Fittings Used to Make ..... 781
Holder for Needle and Thread..... 950
Holder for Playing Cards..... 593
Holder for Roll of Wrapping Paper..... 782
Hole, Square, Round Bit Bores..... 795
Holes, Punch Used to Enlarge..... 127
Holes, Square, Cutting with Hacksaw..... 620
Holly, American, Caffeine Found in..... 917
Home Builders, Federal Loan Banks Planned to Help ..... 236
Home, Comfortable, Built on Truck Chassis. 833
Home Refrigeration, Machine for..... 128
Homes, External Features of..... 109
Homesteads in Alaska, Citizens File on..... 75
Honor Roll for Soldiers on City Street..... 396
Hood at Mouth of Shaft, Miners Protected from Falling Ore by..... 582
Hood, Auto, Hand Horn under..... 126
Hook, Folding, Theatergoers' Hat or Bag, Held by ..... 116
Hook for Hat, U-Shaped Guard on..... 435
Hook for Lady's Hat, Wire Used to Make... 286
Hook, Screen Door, Switch for Battery Circuit Formed by..... 288
Hooks and Boxes for Ladder, Fruit Pickers and Painters Aided by..... 450
Hooks, Crane, Scrapped Ship Plates Used to Make ..... 727

Digitized by Google

Hooks on Poles, Fishermen Catch Giant Catfish with ..... 272
Hoops, Embroidery, Tray Made from..... 793
Hoppers, Tilting, on Railroad Gondolas..... 559
Horn, Auto, Old, Knocks in Auto Engine Located by ..... 139
Horn, Automobile, under Hood..... 126
Horn, Electric, Men Summoned by Coded Call of ..... 533
Horse Drawn Passenger Vehicles, Nation's Capital Has Many..... 744
Horse Muzzle, Hanging Basket Made into.. 296
Horse, Police after Fugitive Enters Shop on Horse, Swift, Ancient Racing Regulations Bar ..... 672 426
Horse, Tractor on Lawn Mower Displaces... 259
Horse, Wooden, on Wheels..... 440
Horsemen, Carnival Crowds Thrilled by.... 500
Horsemen's Club of Kansas City, Novel Race Track for ..... 660
Horses, Buckets Attached to Fire Hydrants for ..... 91
Horses, Drinking Fountain in Pasadena for. 589
Horses, Street Sprinkler Wagons Haul Water to ..... 893 706
Horses, Tractor Displaces.....
Horses, Wild, Hunting in Utah, by F. Kinney ..... 486
Horticulture—Transplanting Old Fruit Trees 777
Hose on Steam Roller, Steel Cylinder Protects ..... 69
Hose, Trench, Salvage of in England..... 717
Hose Reel Drum Is Lawn Sprinkler..... 114
Hose, Rubber, Bushing for Wooden Plug... 292
Hose, Snap Fasteners Used to Pair..... 635
"Hospital," Pioneer Aeroplane, Succeeded by Larger Type ..... 400
Hospital, Berlin, Machine Sterilizes Nursing Bottles for ..... 846
Hospital Bolster, Canvas Strips Attached to Head of Bed Support..... 70
Hospital, Mountain, Tubercular Patients Learn Trades in..... 736
Hospital Patients, Electric Heated Tray Rack Used to Serve..... 107
Hospital Stretcher Cases, Incline as Means of Ingress for..... 96
Hospital Use for Electric Bell..... 784
Hospital, Walking Chair for..... 900
Hospitals, Government, Dressing Contests Part of Sport Program of..... 527
Hospitals, Memorial, World War Veterans to be Honored by..... 713
Hospitals, Physician Proposes Plan for Judging ..... 331
Hot Plate, Electric, Feet of Navy Men Warmed by ..... 277
Hot Water Bottle, Holder for..... 631
Hotel Dining Room, Replicas of Aeroplane Parts Used to Decorate..... 739
Hotel, Envelopes Provided by for Guests' Valuables ..... 762
Hotel for Chateau-Thierry New Mecca of Tourists ..... 78
Hotel Grounds, Concrete Pergola Adorns... 584
Hotel Guests, Meals Kept Warm in Transit in Insulated Rack for..... 256
Hotel, Largest, Greenhouse on Top of..... 321
Hotel, Motorized, Auto Truck on Wheels Is. 356
Hotel, Perambulating, Crippled Tourist Has 7
Hotel, Sportsmen's, Floats on Lake..... 836
Hothouse, Refrigerating Plant in..... 200
House Boat, River, Drydocked on Piles.... 856
House, Bunk, Farm Labor Problems Solved by ..... 640
House, Explosion Spares Windows but Damages ..... 678
House Lights, Series Parallel Switching for. 292
House, Mobile, on Truck Chassis..... 340
House, Rustic, Building..... 639
Household Devices.....114, 274, 434, 594, 754, 914
Household Devices:
Bathroom Cabinet, Three Mirrors on..... 783
Chest, Electric Lock for..... 794
Doorstop ..... 756
Stovepipe, Can Opener Used to Cut..... 785
Table Lamp, Steering Wheel Used to Make 785
Houses, Cinder Concrete Used to Build..... 834
Houses, Metal Sheathing for..... 858
Houses, Old, Town Salvages..... 107
Houses, Revolving, for Fresh Air Treatment 370
Houses, Wooden, Fire in Mobile Destroys... 257
Hover, Simple, Hens' Efficiency Increased by 378
Hub Caps of Wagon, Tin Cans Used as..... 607
Hub Guard for Automobile, Pipe Used to Make ..... 782
Hub Odometer for Automobiles, New Driving Method Used for..... 204
Hub Tired Wheel for Automobile..... 350
Hull, Boat, Wood and Steel Combined in... 904
Hunters, Pigeon, in Pyrenees, Odd Methods Used by ..... 891
Hunters—The Mechanics of Sighting and Accurate Aiming ..... 478
Hunters, Whale, Torpedo Harpoons Used by 397
Hunters—Why Shooting Downward Is Difficult ..... 954
Hunters, Wild Horses in Utah Sought by, by Frederick Kinney ..... 486
Hurricanes, West Indian, New Florida Station to Detect..... 44
Hut, K. of C., in Heart of New York..... 103
Hyacinth Bulbs, Native, Imported Product Displaced by, by R. C. Crawford..... 572
Hyacinth Bulbs, Producing..... 611
Hyacinth Bulbs, Two Color..... 476
Hydrants, Fire, Buckets for Horses on..... 91
Hydrants, Fire, Riots in Mill Yard Quelled with ..... 99
Hydraulic Press, Germs in Liquid Food Killed by ..... 577
Hydraulic Tube, Merchandise to be Transported via ..... 548
Hydroelectric Plant at Gatun Doubles Output ..... 432
Hydroelectric Plant, Nipigon River to Have 714
Hydroelectric Plant, Paraná River to be Harnessed by ..... 703
Hydroelectric Plants, Iron Ore Smelters to Be Operated by..... 744
Hydroelectric Power Plant, Canadian Cities to Have ..... 552
Hydroelectric Power Plant, Victoria Falls to Have ..... 701
Hydrogen, Inflating Toy Balloon with..... 468
Hypnotism—Radiation from Finger Tips Declared a Fact..... 68

Ice Boats and Sleds, Air Propelled..... 788
Ice Cars, Truck with Elevator Body Loads.. 801
Ice, Crutch to Use on..... 942
Ice, Drifting, Arctic Explorers on..... 512
Ice Lined Caverns in Northeastern Iowa.... 713
Ice, Mexican Oil Well Capped with..... 555
Ice Plant, Central, Fresh Beef Supplied to A. E. F. by..... 71
Ice Sheds, Small, Delivery Made Economical by ..... 268
Ice Skater, World's Record Established in Sweden by ..... 70
Ice, Spur for Walking on..... 926
Iceberg, Steamer Collides with..... 878
Icebergs, Warship Destroys with Big Guns.. 673
Iceland, Misleading Name Given to..... 709
Illumination, Indirect, Inversion of Shade Gives ..... 786
Illumination, Memorial, Crosses of Light as. 4
Incinerator, Garbage, for Destroying Code Books, Navy Department Uses..... 576
Incline, Wood, Boulevard Linked by..... 890
Index, Card, Police Use for Crimes..... 753
Indian, Mexican, Primitive Sundial Used by. 552
Indian Visiting U. S., Diamond Worn in Nose by ..... 571
Indians, Newspaper in Shorthand for..... 842
Indians, Prehistoric, Texas Had Three Types of ..... 170
Indicator, Aeroplane's Ground Speed Shown by ..... 918
Induction Coil, Sparks Produced in Lamp Globe by ..... 628
Industrial Fellowship Idea Grows..... 602
Infants' Home, Metal Chute Fire Escape for 565
Influenza Germ, Scientists Search for..... 903
Ink Bottle, Fiber Board Makes Holder for.. 816
Ink Bottle Holder, Spring Wire Used to Make ..... 618
Ink, Drawing on Glass with..... 299
Ink Eraser, Three-Edged ..... 604
Ink for Drawing, Device for Drying..... 457
Ink, Impression of Leaves with..... 464
Ink, India, Writing on Photo Negatives with 315


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Ink on Manuscripts, Collodion Preserves.... 445
Ink, Red, Diluted for Blueprint Tracings.... 628
Ink, Unbleachable, Peace Conference Receives ..... 2
Ink Well and Letter Opener, Slab of Wood Used to Make..... 478
Inoculation—Operating Table for Hogs, Kansan Invents ..... 584
Inscriptions in Mines in Sinai..... 830
Insect Pests—Grasshoppers, Trap Rollers Crush ..... 677
Insect Photography, Comic..... 626
Insecticide Sprayer, Advertising Signs Made with ..... 770
Insects and Ants, House Made Proof against 302
Insects—Butterfly Farm, France Starts..... 883
Insects—Caterpillars, Burning Kerosene Cloth on Screen Cone Kills..... 305
Insects—"Cooties," Locomotive Steam Used to Kill ..... 386
Insects, Cranberry Destroying, Pacific Coast Growers Fight ..... 730
Insects—Flies, Fish Hatcheries Buy..... 557
Insects—Flies, Kerosene on Cloth in Garbage Can Kills..... 315
Insects, Glass Insulators on Refrigerator Legs Keep Out..... 132
Insects—Mosquitoes, Malarial, Painted to Determine Flight of..... 758
Insects—Mosquitoes, Municipal Bat Roost Eliminates ..... 392
Insects—Moths Attracted to Trap by Lantern ..... 406
Insects on Park Trees, Engine and Compressor for Spraying..... 701
Insects, Scientists Explain Rainbow Colors of ..... 14
Insects—Spraying Solution, Fertilizer Used as ..... 568
Insects—Tree Crickets as Thermometers... 474
Insects, Windshield Screen Keeps Out..... 886
Insigne, New, for Air Craft..... 371
Institute, National, Canadian Chemists Form 264
Instrument—Dendrograph Records Changes in Sizes of Tree Trunks..... 96
Insulation, Fibrous Seaweed Used for..... 523
Insulation for Low Voltage Wires, Soda Fountain Straws Dipped in Paraffin Used for ..... 307
Insulators, Glass, Insects Kept from Refrigerators by Using..... 132
Insulators, Wiring, from Inner Tubes..... 297
Insurance, Aerial, Company Writes..... 894
Insurance, Aviation, British Companies Prepare for ..... 68
Insurance Companies, Air Risks Underwritten by ..... 236
Interphone Helmets, Airmen of Squadron Equipped with ..... 246
Invalids, Bedridden, Bolster for..... 70
Invalids, Hand Loom for..... 54
Inventions, Army, Soldiers Entitled to Pay for ..... 536
Inventions, Early Models Show Progress in 417
Inventor, Japanese, 120 Pound Automobile Made by ..... 820
Inventors, Air Service Asks Aid of..... 411
Inventors, American, Peace Treaty Has Interest for ..... 534
Inventors' Designs for Semiautomatic Rifle, War Department Asks for..... 504
Inventors, Soldier, Pay Due to..... 536
Iron and Brass, Valve Grinding Compound Used to Polish ..... 776
Iron, Circular Discusses Rust Proof Metallic Coatings for ..... 534
Iron, Electric, Signal Lamp for..... 476
Iron, Lead Coating by New Process for..... 352
Iron Man, Mechanical, Automobile Controls for ..... 228
Iron Masks, Crews of French Tanks Guarded by ..... 78
Iron Ore Smelters, Electric, Planned for Dutch East Indies..... 744
Iron Pads on Tractor Wheels, Road Damage Prevented by..... 701
Iron Pipe, Walnuts Hulled with..... 632
Iron Scrap, Wagon Trace Repaired with.... 940
Iron, Steam Bath Prevents Rust on..... 118
Iron Sulphate, Giant Fruits Grown with Aid of ..... 142
Iron, Swiss Scientist Discovers Rust-Proof Process for ..... 378
Iron, Tailor's, Boy with Broken Arm Uses to Explode Torpedoes..... 761
Iron Vats, Largest, Shipped by Rail..... 534
Ironing Board, Aluminum, for Suitcase.... 274
Ironing Board or Stepladder, Convertible Chair Used as..... 434
Irrigating Can for Flower Basket..... 386
Irrigation, Gasoline Engine Pumps Water for ..... 718
Irrigation, Holy Land to be Irrigated by Canal under Jerusalem..... 823
Irrigation, Swamp Land of Florida to Be Reclaimed by ..... 172
Irrigation—Whirling Sprayers for Fruit Orchards ..... 356
Island, Barren, Made Tropical for Movies. 856
Island, Hog, Transatlantic Terminal to be Made of ..... 880
Islands, South Sea, Japan Visited by Natives from ..... 810
Isometric Drawing, Triangle for..... 926
Ivory, Artificial, from Eggshells..... 444
Ivory, Imitation, Treated Gelatin Used to Make ..... 561

Jack and Beams, Heavy Duty Press Made with ..... 772
Jacks, Passenger Coaches Lifted from Trucks by ..... 565
Jacks, Truck Wheels Handled by..... 142
Jackson, Percival E.:
Training the Aerial Observer..... 113
Japanese, 120 Pound Automobile Invented by ..... 820
Jenkins, Paul A.:
America's Transatlantic Seaplane Visits England ..... 205
British Become Expert in the Erection of Huge Rigid Airships ..... 644
British Dirigible Makes Pioneer Round Trip Over Atlantic Ocean..... 326
"Flying Parson" First to Complete Longest Air Race..... 819
The Transatlantic Flight..... 19
Unheralded Nonstop Flight Spans Atlantic 165
World Awaits Globe Circling Flight by Magellan of the Air..... 350
Jetties, Concrete, Lighthouse Protected from Sea by ..... 702
Jetties, Extensive, Genoa, Italy, to Build.... 748
Jetties, Steel, Erosion of River Bed Stopped by ..... 814
Jewel and Casket, Mrs. Wilson Receives from People of Paris..... 254
Jewel Case in Form of Book..... 434
Jewel, Curator Carries in Pocket from Paris to Bordeaux ..... 122
Jewel—White Zircons Proposed as Diamond Substitute ..... 523
Jeweler, Diamonds Displayed on Spring Mountings by ..... 155
Jewelry, Bracelet, Rosary in Relief on..... 436
Jewelry, Champion Airman Presented with. 518
Jewelry Designing, Cincinnati Schools to Teach ..... 566
Jewels, Lodge Emblem Covered with..... 405
Jig Has Quick Clamping Motion..... 287
Jig Saw, Sewing Machine Made into..... 629
Joint, Artificial, Spanish Surgeon Invents... 383
Joint, Universal, for Light Connection..... 133
Jointer, Portable, Electricity Operates..... 488
Juggler, Tricks Performed on High Chimney Top by..... 385
Junk and Targets, Warships Used as..... 587
Junk Receptacles Handy to Kitchen..... 605
Junk, Rusty, Old German Yacht Cut Up as. 383
Jury Pole on Wagon, Desert Escape Aided by ..... 864

Kangaroo, Wild, Photograph of..... 601
Keg, Beer Window Display Features Phonograph Made of..... 325
Keel, Hollow, Motor and Propellers of Ship in ..... 714
Kennel, Dog, for Traveling..... 914
Kerosene Burner, Gas Generated by..... 115
Kerosene Cloth, Caterpillars Killed by Burning in Screen Cone..... 305
Kerosene Evaporation, Clock Lubricated by 637

Digitized by Google

Kerosene Lamp, Flame Spreader for..... 618
Kerosene on Cloth in Garbage Can, Flies Killed by ..... 315
Kerosene on Glass Cutter for Straight Work 290
Kerosene or Gasoline, Nickelplate Polished with ..... 310
Key Attachment, Burglar Frustrated by.... 594
Key Blank, Bottle Opener Formed from.... 634
Key Ring, Paper Clip Used as..... 635
Key Sockets, Pull Sockets Made of..... 311
Keyholes, White Paper Makes Visible..... 158
Keys, Tin Can, Racks Fashioned from..... 151
Keys, Wire Nails Used to Make..... 157
Kindergarten, Model City Used to Teach Rules of Safety in..... 600
Kindling Wood, Newspapers Used for..... 294
Kinney, Frederick:
Hunting Wild Horses in Utah..... 486
Kitchen Ash Chute, Steps Saved by..... 144
Kitchen Cabinets, Packing Cases for Europe Become ..... 375
Kitchen, Civic, Buffalo, N. Y., Has..... 712
Kitchen, Field, for Army, Boy "Hikers" Served Meals by..... 230
Kitchen Junk Receptacle..... 605
Kitchen Scouring Powder, Grease Cleaned from Machine Belts with..... 155
Kitchen Utensils:
Broiler and Griddle Combined..... 754
Broiler, Heated Gases Pass Through Hollow Tubes in..... 595
Brush, Fountain, Many Uses for..... 595
Can Opener, Easy Operating..... 799
Corn Popper, Dried Fruits Washed in..... 925
Chopper, Razor Blades Used to Make.... 125
Clothesline, Self-Tightening Holder for... 595
Clothesline Support on Window of Apartment House ..... 114
Coffeepot, Creamer, and Sugar Bowl Nest Together ..... 115
Dishwasher, Kitchen Table When Open Is. 115
Fire Kindler, Asbestos Used to Make..... 150
Gas Bread Toaster ..... 755
Gas, Kerosene Burner Generates..... 115
Handle, String Holder Made of..... 300
Ironing Board, User Folds Without Stooping ..... 114
Kitchen Knives, Holder for..... 139
Magnet in Broom Handle, Tacks Picked Up by ..... 155
Milk Bottle Opener, Wire Bent to Form.. 286
Mitten for Lifting Hot Dishes..... 624
Mop, "Fountain," Tank Slips over..... 115
Pie Tin, Bubbling of Crust Prevented by Hole in ..... 151
Rack for Kitchen Utensils..... 610
Shears, Pineapple Eyes Removed with.... 595
Stove, Kitchen, Stepladder Combined with 275
Strainer, Semicircular, for Cooking Vessel Top ..... 595
Tea Wagon and Dishwashing Machine Combined ..... 277
Tongs, Mason Jars in Hot Water Handled with ..... 275
Tray for Fruit Bottles, Boiler Bottom Supports ..... 275
Warming Closet ..... 606
Window Clothesline Support for Apartment House ..... 114
Kite, Aeroplane, Three Propellers on..... 760
Knife and Fork, Convertible, for Cripple.... 915
Knife Handle, Pearl, Solder Used to Repair. 310
Knife, Pocket, Tape Measure in..... 275
Knife Sharpening Steel, File Used to Make.. 798
Knights of Columbus Hut in Heart of New York ..... 103
Knives, Kitchen, Holder for..... 139
Knob, Door, Used as Faucet Handle..... 785
Knuckle Joints, Open, for Adjustable Electric Light Fixtures..... 394

Labor Apprenticeships, Calendar Estimates. 780
Laboratories, Portable Power Plant for Use in ..... 564
Laboratory, Mine, Opens with Rescue Contests ..... 186
Laboratory Test, Value of Imported Oils Determined by ..... 868
Laboratory Tests of Mildew Proofing Process 593
Lace Making, Sanitarium Teaches Tubercular Patients ..... 736
Laces for Shoes, Shellac Used to Retip..... 155
Lacquer, New, Crystal Surface Effect with.. 77
Ladder and Door Combined, Silo Improved by ..... 559
Ladder, Combination ..... 459
Ladder, Extension for One Side of..... 773
Ladder for Orchard, Self-Supporting..... 135
Ladder Head for Painting..... 774
Ladder Hooks and Boxes, Fruit Pickers and Painters Aided by..... 450
Ladder, Sectional, Easily Transformed..... 919
Ladle, Melting, Earthenware Vase Used to Make ..... 605
Lagoons in Park, Rescuing Outfits on Shores of ..... 524
Lake, Artificial, Proposed for African Desert 579
Lake Jackson, Yellowstone Park to Include. 324
Lake Merritt, Improvements of, by C. W. Geiger ..... 729
Lake, Sportsmen's Hotel Floats on..... 835
Lakes, Michigan, Pump Fertilizer from..... 486
Lamp, Draftsman's, Bracket for..... 941
Lamp, Electric, Nonactinic Rays Given Off by ..... 524
Lamp, Falling, Snuffer on Wick Extinguishes Flame of..... 438
Lamp for Top Board of Piano..... 114
Lamp Globe, Induction Coil Produces Sparks in ..... 628
Lamp Globe, Water Heater Made from..... 955
Lamp, Incandescent, Small Fountain Operated by ..... 276
Lamp, Kerosene, Flame Spreader for..... 618
Lamp, Miniature, for Hot Evenings..... 316
Lamp, Miners' Safety, Benzine Used as Fuel in ..... 762
Lamp, Nursery, Artistic Silhouette Shade for 916
Lamp, Position of Arc Light Carbons Shown by ..... 147
Lamp Shade and Carbon Lamp, Drawing Ink Dried with ..... 457
Lamp Shade, Silk Cover Makes Lantern of. 115
Lamp Shade, Steel Helmet as..... 466
Lamp, Signal, for Electric Iron..... 475
Lamp Socket, Doorbell Ringing Transformer Screws Into ..... 274
Lamp Socket, Wireless Telephone Outfit Plugs Into ..... 666
Lamp, Street, City Experiments with..... 873
Lamp, Table, Electric Phonograph Combined with ..... 275
Lamp, Table, Steering Wheel Used to Make 785
Lamp Wicks, Felt Hats Used to Make..... 950
Lamps, Auto, Punching Holes in..... 445
Lamps, Incandescent, Arcs Run in Series with ..... 4
Lamps, Incandescent, Tool Removes..... 133
Lamps, Memorial, for Soldiers, City Erects.. 591
Land Aeroplane, Tri-Motored, Tests Passed by ..... 814
Land, Made, Lincoln Park Adds Annex of.. 888
Land, Swamp, Florida to Reclaim by Irrigation Project ..... 172
Land, War Department Purchases..... 416
Landmark, Civic, Old Palm Tree Transplanted as ..... 224
Landscape Gardening—Dwarf Trees, Growing of ..... 309
Landslides on Twin Peaks, Road Workers Kept Busy by ..... 87
Languages—Chinese, Spoken, Columbia University Includes in Summer Curriculum... 341
Languages, Nine, Trade to be Encouraged by Cable Code in ..... 356
Lantern, Electric, Lights When Lifted..... 158
Lantern, Moths Attracted to Trap by..... 406
Lantern, Silk Cover Changes Lamp Shade into ..... 115
Lantern Slides, Paper and Magazine Pictures Used to Make..... 304
Lard and Soap, Summer Ski Slide Greased with ..... 641
Lard, Glue Bottle Stopper Prevented from Sticking by ..... 936
Lard Pail, Oat Sprouter Made of..... 616
Last, Automobile Tire, for Garages..... 756
Latch for Garage Door..... 287
Latch, Low Speed, for Auto Pedal..... 461
Lathe Centers, Test Gauge for..... 292
Lathe Chips, Fan Blows Away..... 156
Lathe Dog, Gripping Threads with..... 605


Digitized by Google

Lathe Dog, Notches Help to Hold..... 934
Lathe, Feed for Radius Work in..... 288
Lathe, Gears Cut with..... 776
Lathe, Geometric, Plates for Mexican Money to be Made by..... 279
Lathe, Levers Replace Nuts on..... 136
Lathe—Magnetic Chucks, Device Increases Use of ..... 591
Lathe, Screw Cutting, Graduations on Rule Made by ..... 460
Lathe Tool Holder, Four Points Carried by.. 597
Lathe Tool, Multiple Purpose..... 931
Lathe, Wood Turning Tool for..... 137
Lathe Work, Center Scraper for..... 778
Launching Device, English Shipyards Test.. 571
Launching Device for Lifeboat, Sea Accidents Prevented by..... 885
Launching of Concrete Ship at Mobile, Alabama ..... 719
Launching—Steamer Slides Into Water Ready for Voyage..... 521
Laundries, Mobile, Ordered to Mexican Border ..... 726
Laundries, Public, in Madrid, Wheelbarrows for ..... 547
Laundry—Clothesline Reel and Tightener.. 755
Laundry, Home, Mangle for Attaches to Wringer ..... 652
Laundry—Hose, Snap Fasteners Used to Pair ..... 635
Laundry Machine, Collars Ironed with Human Skill by..... 593
Laundry—Washboard, Mittens Take Place of 635
Lava Column, Volcano Spouts..... 853
Lawn, Automobile Pulls Drag to Grade..... 98
Lawn Mower Tractor, Horse Replaced by.. 259
Lawn Mowers, Automobile Draws..... 301
Lawn Sprinkler, Drum of Hose Reel Forms.. 114
Lawn Sprinkler, Turtle Acts as..... 800
Lawn Sprinkler, Water Distributed in Half Circles by ..... 256
Lawns, Grass Mowing Race Ends Arguments Over ..... 424
Lead, Chalk Used When Filing..... 302
Lead Coating on Turbine Blades, Abrasion Prevented by ..... 496
Lead, New Process of Coating Iron with.... 352
Lead, Paint Pigments Made from Selenites of 426
Lead Ribbon, Cut Flower Holder Made of.. 477
Lead Seals, Electric Machine to Cast..... 573
Lead, Steel Gauze Reinforcement for..... 602
Lead, White, Removal of Babbitting Mandrel Facilitated by ..... 781
Leaks, Testing Metal Float for..... 620
Leather and Brass Cementing, Hot Flatiron Used for ..... 766
Leather Articles, Oil Treatment for..... 657
Leather Belt, Braided, Making of..... 795
Leather from Fish Skins, New Curing Process Makes ..... 886
Leather, Goat Skin, Valued According to Weight ..... 752
Leather Production, Marine, Shark Seines Aid ..... 674
Leather Shoe Soles, Varnish Used to Preserve ..... 791
Leather Strips on Bicycle Tires..... 784
Leather, Waterproofed, Scientific Methods Used to Test..... 598
Leaves, Ink Impressions of..... 464
Leaves, Three Cornered File on Stick Picks Up ..... 622
Lens Cement, Emergency, White of Egg Used as ..... 154
Lenses for Optical Purposes Easily Dented or Corroded ..... 919
Lenses, Sun's Rays Gathered by to Run Steam Engine ..... 795
Letter Carriers, City without..... 828
Letter, Eight Months on Way, Soldier Receives ..... 664
Letter Opener and Ink Well, Slab of Wood Used to Make ..... 475
Letters and Pictures, Navy Department Collects ..... 499
Level, Builders', Pipe Used to Make..... 782
Levers, Nuts on Lathe Replaced by..... 136
Lewis, Lloyd D.:
Highwaymen of the Air..... 41
What Makes the Film Go 'Round..... 683
Liberty Aeroplane Motor, Development of.. 681
Liberty Loan, Adding Machine Registers Totals of ..... 53
Liberty Loan Campaign, Pavement Is Billboard for ..... 58
Liberty Plane, New York-Toronto Race Triumph for ..... 700
Libraries, Memorial, World War Veterans to be Honored by..... 713
Library Association, American, Ex-Soldiers to be Furnished Books by..... 752
Library Table and Writing Desk Combined. 755
Library Table, Drawing Table can be Made of ..... 765
Library, University of Louvain, Subscription for ..... 844
Life Preservers, Bathing Beach, Torpedo Shape for ..... 64
Life Preservers of Stamped Copper..... 417
Life Saving Alarm System, Lake Merritt Has, by C. W. Geiger..... 729
Life Saving Outfits, Park Lagoon Shores Equipped with ..... 524
Life Saving Rafts, Ships Form False Sides.. 39
Lifeboat Launching Device, Sea Accidents Prevented by ..... 885
Lifeboats, Fabric, Airship Ballonets Inflate 665
Light—Arc Carbon, French Invent Novel... 524
Light Beam, Talks Over..... 811
Light Connection, Universal Joint Used for. 133
Light—Electric Lamp, Nonactinic Rays Given Off by..... 524
Light, Electric, White Porcelain Shade for. 914
Light, Emergency, for Tire Work..... 611
Light—Factory Lighting Prevents Accidents 739
Light—Falling Lamp, Snuffer Extinguishes Flame of ..... 438
Light—Farmhouse Electric Lighting System, Portable Bungalow Demonstrates... 245
Light Fixtures, Adjustable, Open Knuckle Joints for ..... 394
Light, Flash, Metal Strip Makes Dry Cell into ..... 276
Light for Poultry House..... 926
Light—Fountain Pen, Battery in..... 888
Light—Guard Irrigation Dam by Lighting River ..... 907
Light, Indoor, at Small Expense..... 443
Light—Lantern on Trap Attracts Moths.... 406
Light, Miniature, for Hot Evenings..... 316
Light, Particles Removed from Eye with... 931
Light Rays, Selenium, Fire Alarm System Operated by ..... 224
Light, Reflected, Right Angle for Sawing Found by ..... 310
Light—Street Lamps, Experimental, on City Boulevards ..... 873
Light, Table, Electric Phonograph Combined with ..... 270
Light, Yellow, Scientific Basis for Popularity of ..... 862
Lighthouse, Concrete Jetties Protect..... 702
Lighthouse, Tillamook, Telephone Links with Mainland ..... 841
Lighthouse Wireless, Fog Signals Sent by.. 842
Lightning Arrester, Radioactive Salts Used in ..... 62
Lightning, Concrete Bridge Damaged by... 555
Lightning, Fire Destroys Oil Tank Struck by 704
Lightning for Moving Picture Scenes, Huge Coil Used to Make..... 220
Lightning Power, Improved Apparatus for Measuring ..... 668
Lights, House, Series Parallel Switching for 292
Lights, Poorly Placed, Trade Lost by..... 158
Lights, Red, Autoists Kept to Main Road with Aid of ..... 910
Lights, Street, Wagons and Equipment for Cleaning ..... 910
Lignum-Vitæ Tree, Battleship's Propeller Shaft Bearings Made of..... 662
Lily Pad, Child Supported by..... 760
Lime and Sulphur, Truck Tree Sprayer Uses 565
Limousine Body, Cashier's Office of Auto Filling Station in..... 694
Limousine, Convertible, Becomes Ambulance 581
Lineman, Powerful Electric Current Fails to Kill ..... 524
Linoleum, Discarded, Henhouses Weatherproofed with ..... 779
Linoleum on Auto Mat..... 610

Digitized by Google

Linoleum, Slate Waste of North Wales to be Made into ..... 668
Lion, "Pershing," Children Celebrate Birthday of ..... 281
Lioness, Automobile on Road Kills..... 96
Lioness, Escaped, Townspeople Hide in Cellars from ..... 55
Liquid Fire and Steam, Corn Borer Killed with ..... 585
Liquor—Hard Stuff, On the Trail of the, by E. T. Bronsdon ..... 343
Live Stock, Kudzu Plant Grown as Forage for ..... 104
Live Stock Subway, Cattle Killing by Trains Stopped by ..... 186
Lizards, Southern Swamps Furnish for Greenhouses ..... 724
Loan Subscriptions, Panama, Submarine Carries ..... 237
Lobsters, Live, Airplane Carries Shipment of 386
Lock and Alarm, Auto, Tubular Bumper Conceals ..... 393
Lock, Auto Radiator Cap, Attachments Protected by ..... 438
Lock, Electric, Chest Has..... 794
Lock for Automobile, Strap Hinge Used to Make ..... 286
Lock for Blacksmiths' Tongs..... 774
Lock, Notch in Prevents Picking..... 299
Locker, Tonneau, for Automobile..... 594
Locker, Tool, and Bench Combined..... 134
Lockers, Picnic Party, Pasadena Public Park Has ..... 751
Locks of Cashier Cages, Device Prevents Picking of ..... 202
Locomotive, Air Propelled, Is European Novelty ..... 913
Locomotive, Automobile Serves Laborers' Train as ..... 748
Locomotive, Automobiles Side by Side Hit.. 392
Locomotive Cinders, Plant for Handling.... 427
Locomotive, Coach Is Part of..... 498
Locomotive Crane, Railroad Track Transferred with ..... 662
Locomotive Crane, Railroad Water Tank Lifted by ..... 348
Locomotive, Early Model of..... 417
Locomotive Fire Box, Improved, Coal and Water Saved by ..... 122
Locomotive, Mechanical Stoker Feeds Coal to 398
Locomotive, Military, Auto Chassis Becomes 324
Locomotive on Trailer, Motor Truck Hauls. 539
Locomotive Spark Arrester, Fire Claims Reduced by ..... 44
Locomotive Steam, "Cooties" Killed with... 386
Locomotive, Storage Battery, for Mines.... 6
Locomotive, Storage Battery, Train Pulled by ..... 906
Locomotives, Central Drying House Supplies Sand to ..... 905
Locomotives, Roumania Looks to U. S. for New Supply of ..... 88
Locomotives, Scuttled Ship Raised by..... 74
Locust, Seventeen Year, Interesting Visitor 188
Lodge Emblem, Valuable Jewels Cover..... 405
Log Cabin as Office, Real Estate Man Uses. 896
Log Cabin, Brigham Young's, Greek Style Shutter for ..... 90
Log Cabin, El Paso Red Cross Chapter Occupies ..... 90
Log Cabin Tomb of Trapper..... 814
Logging Train, Runaway Smash Up of..... 258
Logs, Bamboo, Serve Instead of Buckets in Hawaiian Islands ..... 760
Logs, Motor Truck Trailers Carry..... 824
Logs on Chute, Fire Caused by Friction of. 892
Logs, Sunken, High Pressure Water Streams and Compressed Air Raise..... 278
Looking Glass, Rigid Frame, Changing to Tilting Type ..... 295
Loom, Hand, for Invalids..... 54
Lots, Vacant, Wild Flowers to Beautify..... 564
Luggage Carrier on Sidecar of Motorcycle.. 68
Lumber Boom at New Orleans, Constructing 541
Lumber, Cheap, Park Gateway Made of.... 297
Lumber—Dodging Freaks and Flaws in Wood, by Brandon Tracy ..... 81
Lumber Jacks, American, in French Forest, "Gravy Trains" Rush Food to..... 250
Lumber Mill, International, Payment of Duty Escaped by ..... 869
Lumber Raft, Shiplike, Towed Long Distance 690
Lumber Tract, Projected 10 Mile Railroad Opens Up ..... 13
Lumbermen, Pneumatic Motors Operate Augers Used by..... 747

Machine with Adjustable Hob Spindle, Spur Gears Cut by..... 426
Machine Shop, Smallest, Big Help in War.. 78
Magazine and Paper Pictures, Lantern Slides Made of ..... 304
Magic Squares, How to Make..... 154
Magnesium Pistons, Aeroplanes Fitted with 876
Magnet, Figures in Toy Theater Moved by.. 921
Magnet in Broom Handle, Tacks Picked Up by ..... 155
Magnet, Lifting, Discarded Shells Unloaded by ..... 692
Magnetic Chucks, Device Increases Use of.. 591
Magnetism in Power Pulleys, Belt Slipping Prevented by ..... 376
Mahogany Furniture, Antique ..... 933
Mail, Anarchists' Bombs Sent through..... 55
Mail Bags, Aerial, Net on Roof of Federal Building to Catch..... 506
Mail Boxes, Newspaper and Package Rack for ..... 797
Mail Boxes on Buggy Wheel..... 611
Mail Carriers, Aerial, First Year's Record of 240
Mail Carriers, City without..... 828
Mail Pouches, Electric Machine Casts Lead Seals for ..... 573
Mail, Registered, Accepted for Turkey in Europe and Turkey in Asia..... 63
Mail Service, Aerial, between U. S. and West Indies ..... 888
Mail Service, Aeroplane, Same as Railroad Service ..... 580
Mainmast of Farragut's Ship, Church Lawn to be Adorned with..... 877
Malaria—Mosquitoes Painted to Determine Flight of ..... 758
Malt and Sweet Potatoes, Sirup Made of.... 704
Man, Mechanical, Ship in Parade Pulled by. 228
Mandrel, Babbitting, White Lead Facilitates Removal of ..... 781
Mangle, Electric, for Wringer of Home Laundry ..... 652
Manila Rope, How to Test..... 927
Manual Training—Miniature Aeroplanes, Boys Make ..... 280
Manure Loader, Rotary Pitchfork on..... 862
Manuscripts, Valuable, Collodion Preserves. 445
Map Making Triple Camera for Aeroplanes. 726
Map of Highways of the Air for U. S. and Canada ..... 244
Map of United States, Mechanic Embroiders on Linen Flag..... 117
Map on Billboard, Motorists Aided by..... 382
Map, Pershing's, National Museum Displays. 45
Map, Relief, Resources of Texas Shown on.. 894
Map Study, Topographical, with Moving Pictures ..... 489
Map, U. S., Photographs Taken by Aeroplanes to be Used in Making..... 200
Maps, Aerial Photographers Will Make..... 276
Maps, Topographical, Making of Requires Hard Work ..... 731
Marble Finish, Imitation, Candle Smoke Produces ..... 314
Marble, Wood Rasp or Coarse File Used to Chip Off ..... 288
Margarine by Government Formula, British Factories Make ..... 278
Marine Work, Cement Containing Gypsum Good for ..... 77
Markers, Air Craft, City will Construct.... 734
Martyrs, Belgian, Public Funeral Honors... 368
Mascot for Auto, Bear Cub as..... 600
Mask, Gas, War Veteran Asphyxiated in Testing ..... 912
Mask, Gas, Woman Dons to Peel Onions.... 902
Masks, Army, Deadly Gas Made Harmless by Absorbent in..... 584
Masks, Criminals Inspected by Detectives Who Wear ..... 98
Masks, Iron, Crews of French Tanks Guarded by ..... 78
Mason Jars in Hot Water, Tongs for Handling ..... 275


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Mast for Wireless, Concrete, Wall of Peking Topped with ..... 857
Mast, Giant, Wireless Repaired by Steeple Jack on ..... 400
Mat, Door, Boycott of German Goods Advocated by ..... 681
Mat for Auto, Linoleum Riveted on..... 610
Mat, Grass, for Gardener..... 611
Match Box, Wire Mesh Used as Scratcher on 305
Match Boxes, Safety, Inexpensive Coating Found for ..... 810
Mathematics, American Soldiers Study in German School Building..... 749
Mathematics—Simple Charts, Mathematical Knots Untied by..... 193
Mathematics—To Divide a Mixed Number by Two ..... 938
Mathematicians, One-Sided Object Studied by ..... 76
Matting, Wainscoting Made from..... 945
Meals, Warm, to Guest Room in Insulated Rack ..... 256
Measurement, How to Take When Obstacles Intervene ..... 635
Measurements—Body Dimensions Used in Measuring ..... 952
Mechanic, First Aid Kits for..... 935
Medal, General Service, Britain to Distribute 527
Medal, Peace, Treaty of Versailles Commemorated by ..... 368
Medal to Allied Fighting Men, France Would Award ..... 599
Medals, "Victory," for American Soldiers.. 116
Medical Coll, Handles Contain Battery for.. 50
Megaphone-Telephone, Trapshooting Referee Uses ..... 29
Melting Ladle, Earthenware Vase Used to Make ..... 605
Memorial, Bowlder, to Newspaper..... 751
Memorial Buildings for World War Veterans 713
Memorial Diplomas, France Adopts for Honoring Dead Soldiers..... 720
Memorial Drive for Roosevelt National in Scope ..... 355
Memorial Building for Illinois is Planned . 649
Memorial in Concrete Basin, Water Surrounds ..... 91
Memorial Lamps for Soldiers, City Erects... 591
Memorial Monument, Cuban General's Memory Honored by..... 393
Memorial, Oak Trees Planted by Seven Brothers Are ..... 563
Memorial, Rheims Cathedral Restoration Planned as ..... 485
Memorial, Soldiers', Chicago Plans Stadium to Be ..... 273
Memorial to Roosevelt, Forest Biological Station to Be..... 255
Memorial Tower, World's Highest, Pittsburgh Plans ..... 484
Memorial, War, Ancient Princeton Hall Remodeled as ..... 236
Memorial, War, Westminster to be Transformed as ..... 259
Memorial—Windows, Crosses of Light Formed by Illuminated..... 4
Memorials to James Watt, Scientists Plan... 590
Men, Arkansas Canning Clubs Arouse Interest of ..... 191
Mending Tissue, Cementing of Leather and Brass with ..... 766
"Mensurgraphy"—A Photographic Method of Studying Deformities, by Robert H. Moulton ..... 361
Merchandise Transportation, Hydraulic Tube to be Used for..... 548
Merchant Marine, America's, Quadruples during War ..... 704
Merchant Marine Students, Training Ships Manned by ..... 697
Mercury Contact, Relay Switch with..... 958
Merry-Go-Round, Aeroplane Lands on..... 537
Mesh Bag, Vanity Case Concealed in..... 435
Metal Boats, Seamless, Cost Less Than Wood 534
Metal, Fusible, Fouling of Gun Barrel Stopped by Using ..... 167
Metal, Lacquer Produces Crystal Surface Effect ..... 77
Metal, Molten, Special Car Body Carries and Pours ..... 167
Metal Sheathing for Houses..... 858
Metal Turning without Lathe..... 609
Metals, Molten, Device Prevents Oxidation of ..... 517
Meteorological Station in Florida, Weather Bureau to Establish..... 208
Meteorological Station in Florida, West Indian Hurricanes to be Detected by..... 44
Meteorologist, Odd Use for Surplus War Munitions Suggested by..... 576
Meteorologists, Volcanic Action Studied by.. 109
Meter for Water on Wheelbarrow, Thefts and Waste Stopped by..... 210
Meter, Gauge Visibility of Vessels by..... 815
Meters, Gas Measuring Device for Calibrating ..... 696
Mice, Fly Paper Used to Catch..... 306
Microbes, Concrete Refrigerator Offers No Hiding Place for..... 324
Microphone, Range Finding, Hot Wire Telephone Used as..... 680
Mildew Proofing Process, Laboratory Tests of ..... 593
Military Training, Boys of New York Start. 829
Milk Bottle Opener, Wire Bent to Form.... 286
Milk Bottle Pasteurizer, Triple Use for..... 843
Milk Bottles for Babies, Machine Sterilizes. 846
Milk Can, Opening..... 316
Milk, Factory Employes Drink..... 412
Milk, Pan with Hole in Bottom to Draw.... 315
Milk, South American Tree Sap Is Substitute for ..... 437
Mill, Water, Ex-Kaiser Labors in Effigy beside ..... 876
Mill, Water, Nuts and Straws Used to Make. 793
Milling Machine, Enormous, Is Fine Precision Tool ..... 717
Mills, British, Purified Sewage Water Used by ..... 372
Mine, Coal, Artist Corrects Popular Idea of Working ..... 668
Mine, Diamond, South Africa Uses X-Ray to Locate Secreted Stones in..... 39
Mine, Floating, Swedish Steamship Captain Dissects ..... 373
Mine Laboratories, Rescue Contest Opens.. 186
Mine Mules, Shower Bath for..... 14
Mine, Nature Ventilates with Single Shaft.. 415
Mine Owners, Aeroplanes to Carry Ore Bought by ..... 116
Mine, Profitable, Homemade Drill Locates... 568
Mine Rescue Crews, American Equipment for ..... 866
Mine Silt, Coal, Fuel Derived from..... 412
Mine Stoping Drill, Air Rotates..... 846
Mine "Timbers," Concrete Used to Make.... 762
Mine Tunnel, Powder Explosion Kills Many in ..... 395
Mineral, Sodium Bearing, Hard Water Softened with ..... 407
Minerals—Gold and Other Minerals in Siberia ..... 30
Minerals—Texas Oil Borings Examined for Valuable Deposits ..... 89
Miners in Shaft, Hood as Protection for..... 582
Miners' Safety Lamp, Benzine Used as Fuel in ..... 762
Miners, Trapped, War Device Aids in Rescue of ..... 2
Mines, Chemical Odors as Warning Signals in ..... 386
Mines, Coal, Grow in Importance in Africa.. 734
Mines—Chute Hooks, Springs Support..... 941
Mines, Drifting, Rifle Fire Destroys..... 496
Mines, Flooded by Germans, Water Pumped Out of ..... 736
Mines, Iron, Hydroelectric Plants to Operate in Dutch East Indies..... 744
Mines, Lamp Giving Nonactinic Rays for Use in ..... 524
Mines of Antiquity in Sinai, Inscriptions in. 830
Mines of Phosphate, Florida Has World's Greatest, by James Anderson..... 387
Mines, Self-Propelling Scoop Loader for.... 219
Mines, Storage Battery Locomotive for..... 6
Mining District, Gold, Drainage Tunnel Unwaters, by J. E. Murphy..... 742
Mining Locomotive, Storage Battery Drives. 906
Mink, Live Bait Trap for..... 792
Mirage, Road, Auto Appears Double in..... 884
Mirror Aids in Shaving..... 467

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Mirror Bait, Raccoon Trap Set with..... 319
Mirror, Levels Sighted with..... 453
Mirror on Hacksaw Blade..... 452
Mirror, Rigid Frame, Changing to Tilting Type ..... 295
Mirror, Searchlight, and Flag Holder for Automobiles ..... 755
Mirror, Thin Clock Has Frame below Face for ..... 754
Mirrors, Three, on Bathroom Cabinet..... 783
Mitten Drier, Heat Coil as..... 637
Mittens, Tin Ribbed, Washboard Displaced by ..... 635
Mixer for Asphalt or Concrete, Street Roller Carries ..... 202
Model Airships and Aeroplanes, Wind Tunnel for Testing ..... 402
Model, Artist's, Gallows Used to Hoist..... 803
Model Mountain, Moving Pictures of, Topographical Map Study with..... 489
Model of Early Cotton Gin..... 417
Model of Early Locomotive..... 417
Model of Early Sewing Machine..... 417
Model of Early Typewriter..... 417
Molds for Concrete Flowerpots, Pails Used as ..... 124
Molds, Paper, Concrete Test Cylinders Made in ..... 896
Molybdenum, Paint Pigments Made from... 426
Money—International Currency to Stabilize Foreign Exchange ..... 821
Money, Mexican, Geometric Lathe Makes Plates for Printing..... 279
Monkeys, Typewriter and Wading Pool for. 812
Monoplane, American Loops the Loop 300 Times in ..... 107
Monoplane Dart for Child, Rubber Band Shoots ..... 440
Monoplanes, Midget, French Offer at Popular Price ..... 375
Moon, Shadow of on Earth in Annular Eclipse, by L. J. Wilson..... 757
Moonlight, Artificial, How to Make..... 958
Moonlight Scenes, Photographing..... 624
Monument, Bowlder Is, to Newspaper..... 751
Monument, Concrete, Novices Fashion..... 814
Monument Construction, New, Expense Saved by ..... 187
Monument, Crude, Armistice Day Battle Line Marked by ..... 697
Monument, Cuban General's Memory Honored by ..... 393
Monument in Training Camp, Soldiers Erect. 700
Monument, Wreaths for World War Martyrs on ..... 589
Mop for Floor, Wheeled Tank Used as..... 705
Mop, "Fountain," Has Water Tank on Handle ..... 115
Morgue, Automobile Speeders Sentenced to Trip through ..... 523
Mormons—Brigham Young's Log Cabin, Greek Style Shelter for..... 90
"Mosaic" Sugar Cane Disease, Japanese Cane Immune to ..... 254
Mosquito Larvæ, Oil Soaked Sawdust Destroys in Rice Fields..... 752
Mosquito Netting Stitched on Embroidery Hoop, Flower Holder Made with..... 152
Mosquitoes and Malaria, Municipal Bat Roost Eliminates ..... 392
Mosquitoes, Malarial, Painted to Determine Flight of ..... 758
Moss, Mysterious, Fish Killed by..... 662
Moths, Lantern in Trap Attracts..... 406
Motor and Propeller, Silent, for Aeroplanes. 168
Motor, Automobile, Street Car Trailer Propelled by ..... 750
Motor Car, Chinese Boy Helps to Make..... 761
Motor Car, Japanese, Weighs Only 120 Pounds ..... 820
Motor Driven Egg Beater..... 319
Motor, Electric, Set of Attachments, Egg Beater, Fan, and Drill in..... 914
Motor, Electric, Spindles on Shaper Driven by ..... 423
Motor, Electric Toy, Yarn Wound with..... 949
Motor, Engine, and Dynamo in German Train Drive ..... 7
Motor Fire Engine, Rotary Pump for..... 582
Motor, Four Ounce, in Dental Tool..... 901
Motor, Liberty, Development of..... 681
Motor, 1,000 Horsepower, for Aeroplane.... 489
Motor Pistons, Automobile, Tool for Fitting. 778
Motor, Rotary, Tilted Disk Replaces Crankshaft in ..... 841
Motor, Row of Fans Driven by..... 449
Motor Starting Switch, Man Protected by... 69
Motor Truck, Locomotive on Trailer Hauled by ..... 539
Motor Truck, Power Applied to Four Wheels of ..... 540
Motor Truck Trailers, Logs Carried by..... 824
Motor Truck Train, 15 Tons Carried by..... 269
Motor Trucks, Coal Carrying, Unloader for.. 715
Motorboat, Aquarium Collecting, Specimen Well in ..... 741
Motorboat for Commuters, Auto Speed for... 840
Motorboat for Danube River of Special Design ..... 376
Motorboat, Muffler Stove on..... 630
Motorboat Race, Record Broken in..... 745
Motorboat, Speedy, Sleeping Quarters on... 673
Motorboats, Sail Rigged Ships Made into.... 874
Motorboats, Two Thousand, Feed a City, by H. H. Dunn..... 721
Motorcycle and Trailer, Firewood Hauled by 87
Motorcycle Car, Old Automobile Parts Used to Make ..... 741
Motorcycle Chain, Varnish Brush Keeps Clean ..... 156
Motorcycle Climb, Spills Supply Thrills in.. 226
Motorcycle "Cop" in Boiler, Speeders Captured by ..... 112
Motorcycle Drive Chains Oiled While Running ..... 937
Motorcycle Engine, Gravity Switch Stops... 628
Motorcycle Engine, Students Build Tractor Cultivator Using ..... 280
Motorcycle Garage, Box Made into..... 455
Motorcycle Handlebar Clamp, Vacuum Bottle Held by..... 312
Motorcycle Is Cripple's Perambulating Hotel 7
Motorcycle, Luggage Carrier on Sidecar of. 68
Motorcycle on Beach, Rider When Driving Stands Erect on Saddle of..... 393
Motorcycle, Papier-Maché Pony on..... 498
Motorcycle, Power Sled Made from..... 947
Motorcycle Sidecar Taxi, Passengers Carried in ..... 255
Motorcycle Takes to Water from Beach..... 895
Motorcycle Tool Shop, Power Driven Emery Wheel on ..... 217
Motorcycle, Windlass to Raise..... 622
Motorcycle, Windshield for..... 59
Motorcycles, Stretcher Bearing Sidecar on.. 56
Motorcyclist, Acrobatic, Beach Crowd Thrilled by ..... 330
Motorcyclist, Face Protector for..... 944
Motors, Dissected, Gas Engine Theory Learned from ..... 838
Motors, Electric, Battleship "New Mexico" Driven by ..... 646
Motors for Aeroplanes, Government Loses on Sale of ..... 416
Motors, Rubber Corks Take Up Vibration of 157
Motors, Shop, Installing on Ceiling..... 298
Motors, U-Boat, Sea Lions Trained to Follow Sounds of ..... 2
Motorwomen, Cars in Albuquerque Run by. 532
Moulton, Robt. H.:
Crossbred Fruits and Grains Disease Proof ..... 562
Kudzu Valuable Forage Plant..... 104
"Mensurgraphy": A Photographic Method of Studying Deformities..... 361
Mound Builders' Tomb, Trinkets Found in.. 688
Mountain Ascents, Rock Piles Record ..... 542
Mountain, Moving, Engineers Check, by H. E. Thomas ..... 805
Mountain—Peak, Pikes, Endless Tread Tractor Reaches ..... 547
Mountain States, Bumper Wheat Crop Raised in ..... 384
Mountain Stream, Disputed, Measuring Flow of ..... 282
Mountain Trail, Forest Service Builds..... 652
Mountains, Catalina's, Loop Turns Improve Roads up ..... 83
Mountains, Tanks in Europe Climb..... 830
Moving Picture Director in Airplane, Locations Easily Found by..... 839

Moving Picture Film, Alaska to Ship to States ..... 80
Moving Picture Films, How to Keep Pliable 614
Moving Picture House Organs, Two, One Organist Plays Both Simultaneously..... 916
Moving Picture Machine, One-Armed Soldier Operates ..... 40
Moving Picture Plant, Many Producers to be Served by ..... 694
Moving Picture, Potato Peeling Machine Shown in ..... 218
Moving Picture Scenes, Lightning Made by Huge Coil for..... 220
Moving Picture Shows, Ignorance to be Combated with ..... 698
Moving Picture Work, Portable Arc Lamp for ..... 265
Moving Pictures, Anatomical Structure Studied with ..... 544
Moving Pictures—Arc Light Carbons, Lamp Shows Position of..... 147
Moving Pictures, Barren Isle Made Tropical for ..... 856
Moving Pictures—Bible to be Filmed..... 820
Moving Pictures, Boy Scouts' Motor Hike Shown in ..... 190
Moving Pictures, First Transatlantic Flight Recorded in ..... 424
Moving Pictures for Community Work, Chinatown Has ..... 32
Moving Pictures, Largest, Distance Record Set by ..... 557
Moving Pictures, Potato Disease Shown by.. 752
Moving Pictures, Sporting Goods Store Has Projecting Room for..... 823
Moving Pictures, Topographical Map Study with ..... 489
Moving Pictures—What Makes the Film Go 'Round, by Lloyd D. Lewis..... 683
Mower, Grass, for Golf Links, Motor Cultivator Used to Make..... 329
Mowers, Lawn, Automobile Draws..... 301
Mud Hook for Auto Trucks..... 297
Muff, Curved, for Children..... 275
Muffler for Aeroplane Engines..... 857
Muffler for Typewriter, Spruce and Balsam Pillow Used as..... 151
Muffler Stove on Motorboat..... 630
Mules, Hay Rake Pushed by..... 176
Mules, Mine, Shower Bath for..... 14
Munitions, Surplus, Meteorologist Suggests Odd Use for..... 576
Murphy, J. E.:
Tunnel Unwaters Famous Gold District... 742
Museum, American, Field Kitchen of Former Kaiser to Be in..... 664
Museum, Ancient Armor Displayed in..... 832
Museum Entrance, Underground Temple Forms ..... 532
Museums, Natural History, Russians Establish on Streets..... 728
Mushrooms, Beer Supplanted in Brewery by 580
Music—Noon Hour Band Concerts for Shipyard Workers ..... 367
Music Rack, Camera Tripod Made of..... 319
Music Roll Cabinet, Pocket Knife Used to Carve ..... 748
Music Roll, Motor Moves Music on..... 839
Music Store, Disklike Phonographs Used in 353
Music, Wireless, Sailors at Sea Entertained by ..... 251
Musical Instruments—Piano Keys, Celluloid Used to Repair..... 767
Musician, Motor Music Roll Turns Music for 839
Musicians, Form Rests Make Flexible the Fingers of ..... 595
Musk Ox and Reindeer, Explorer Designates Northern Canada as Favorable Grazing Grounds for ..... 62
Muzzle for Animals, Humane, Gravity Operates ..... 197
Muzzle, Horse, Hanging Basket Made of.... 295

Nail Brush for One-Armed Person, Rubber Suction Cups on Back of..... 275
Nail, File Cleaner Made of..... 449
Nails, Cement Walks Held Together by.... 951
Nails, Woodsman's Raft Made without..... 474
Name, Prize Offered for..... 800
Naphthols, Shellac Made from Resins Resulting from Combination of..... 404
Narcissus Bulbs, Native, Imported Product Displaced by, by R. P. Crawford..... 572
National Forests, Postmark Advertising Used for ..... 342
National Parks, Automobile Service between 264
Natural History Museums, Small, Russians Establish on Streets..... 728
Naval Air Station, Midget Tractor to Move Aeroplanes Used at..... 744
Naval Airmen's Barrack Equipped like Club 727
Navigation Laws, American, to be Modernized ..... 853
Navigation—Meter, Visibility of Vessels Gauged by ..... 815
Navy, Airship Hangar for Atlantic Coast Planned by ..... 557
Navy, Coast Guard to be Put in..... 192
Navy Department, Garbage Incinerator Used by ..... 576
Navy Department, Pictures and Letters Collected by ..... 499
Navy—Electricians Trained on Dry Land Battleship ..... 829
Navy, Great Dry Dock Constructed in Hawaiian Islands by ..... 495
Navy, Move to Perpetuate Public Use of Wireless by ..... 558
Navy, Peace Time, Three Fleets Now Compose ..... 412
Navy, Rate of Pay Increased in..... 579
Navy Rifle Range Largest in America..... 738
Navy, Seaplane Tours to Brazil and Philippines Planned by..... 896
Navy, Seaplanes Cruise Mississippi River to Stimulate Enlistment in..... 554
Navy Targets and Junk, Warships Used as.. 587
Navy, U. S., German Submarine Recruits for 341
Neck, Broken, Improvised Apparatus Used on Airman to Cure..... 185
Needle and Thread, Holder for..... 950
Negative, Photographic, Writing on..... 315
Negatives, Uneven, Printing Up..... 956
Negro Town, Exclusive, Virginia Builds.... 216
Neighborhood House, Women Raise Funds to Build ..... 588
Net on Roof of Federal Building, Aerial Mail Bags Dropped in..... 506
Nets, Huge, Pigeon Hunters in Pyrences Use 891
Nets, Sugar Beet Loads Removed by Crane in ..... 196
Newspaper, American Soldiers in Russia Publish ..... 740
Newspaper and Package Rack for Apartment Houses ..... 797
Newspaper, Borrowed Acetylene Keeps Going ..... 219
Newspaper, Bowlder Is Memorial to..... 751
Newspaper in Shorthand for Indians..... 842
Newspaper, Razor Stropped on..... 795
Newspaper, Rolled, Coat Hanger Made of... 619
Newspapers, American, Airship "R-34" Carries ..... 574
Newspapers, Kindling Wood Made of..... 294
Newspapers, Rack for Collecting..... 637
Nickel Pointed Soldering Copper for Aluminum Work ..... 299
Nickel Polish, Banana Oil Preserves..... 465
Nickelplate, Kerosene or Gasoline Good Polish for ..... 310
Nipple Tap, Wire Wheel, Old Spoke Used to Make ..... 796
Nitric Acid and Water, Steel Colored Blue with ..... 615
Nitric Acid, Leaking Radiators Repaired with ..... 477
Noise Absorber, Rubber, for Auto Doors..... 442
Novelty, Mathematical, Object with Only One Side Is ..... 76
Nozzle, Air, Carbon Removed from Cylinders by ..... 779
Nozzle Anchor, Firemen's Places Filled by . 101
Numismatists, American, Peace Medal Struck Off by ..... 368
Nursery Lamp, Artistic Silhouette Shade for 915
Nursery Table, Blackboard in Tray of..... 920
Nursery, Theater Provides..... 60
Nurseryman, Glass House on Wheels Convenience for ..... 454
Nut, Brass, and Two Pennies, Cigarette Lighter Made with..... 219

Digitized by Google

Nuts Dropped in Auto, Greased Stick Removes ..... 449
Nuts, Hexagon, Adjustable Wrench for..... 276
Nuts on Lathe, Levers Replace..... 136
Nuts, Pliers for Turning..... 776

Oak Trees, Seven Brothers Plant as Memorial ..... 563
Oat Sprouter, Lard Pail Used as..... 616
Oats, Shoes Stretched with..... 447
Observation Cars, Yale-Harvard Races Viewed from ..... 192
Observation Tower, Fire, Is High Point..... 428
Observation Tower, Florida Equips Indian Shell Mound as..... 91
Observers, Training Aerial, by Percival E. Jackson ..... 113
Ocean, Age of Estimated at 90,000,000 Years 717
Ocean, Atlantic, British Dirigible Makes Pioneer Round Trip Over..... 326
Ocean Beach, Old-Fashioned Stiles Give Access to ..... 37
Ocean Bed, Salvaging Submarine Explores.. 482
Ocean Bottom, Dredge to Hunt for Diamonds in ..... 537
Ocean Breakers, Holes Save Board Walk from ..... 260
Ocean Currents, Dangerous, Chemical Tests Spot ..... 266
Ocean, Explosives Used to Sound..... 726
Ocean Flight, Atlantic, Entries Meet Crowning Mishaps ..... 354
Ocean, Floating Seaplane Bases on..... 847
Ocean Liners, Oil to be Burned by..... 809
Ocean Port, Plans to Make Detroit an..... 871
Ocean Sewer, Success Follows Failure in Laying ..... 174
Odometer, Hub, New Driving Method Used for ..... 204
Odorometer, Chemical Odors in Air as Warning Signals in Mines Tested by..... 386
Oil, Air Pressure Forces from Barrel..... 779
Oil and Rubber, Waterproof Paint Made from ..... 730
Oil, Blocks on Feet Protect Shoes from..... 885
Oil Borings, Texas, Geologist Examines for Valuable Deposits in..... 89
Oil Burners, Frozen Coal in Cars Thawed by 532
Oil Burning Furnace, Heating Expense Reduced by ..... 437
Oil Burning Submersibles may Alter British Navy ..... 828
Oil Claims, Filing in Mexico..... 720
Oil Cooler, Auxiliary Condenser Used as on Steamship "Anoka" ..... 739
Oil Filters for Garage..... 296
Oil Lands in Mexico, Development of..... 895
Oil, Limpid White, Double Size Flax Seed Yields ..... 676
Oil, Ocean Liners to Burn..... 809
Oil, Pen Used to Apply to Typewriter..... 775
Oil Plant in Arizona, Fire Destroys..... 46
Oil Soaked Sawdust, Mosquito Larvæ in Rice Fields Destroyed by..... 752
Oil Sprayer, Two Tip, for Streets..... 404
Oil Tank, Concrete, Is Leak Proof..... 230
Oil Tank, Fire from Lightning Destroys..... 704
Oil Tank Ship, Largest, Oil Rapidly Handled by ..... 404
Oil Tanks, Blazing, New York's Greatest Fire Featured by..... 650
Oil Treatment for Leather Articles..... 657
Oil, Valuable, from Cockleburs, by S. R. Winters ..... 859
Oil, Village in Ohio Transformed by Discovery of ..... 496
Oil, Waste, Pits beneath Railroad Track Stop ..... 335
Oil Well, Mexican, Ice Caps..... 556
Oil Well, Roaring Torch of Oil Gas from... 689
Oil Well Throttled after Six Day Struggle.. 718
Oil Wells, Houses in Texas Villages Outnumbered by ..... 401
Oil, Wood, Lack of Machinery Restricts Chinese in Output of..... 846
Oilcan, Flexible Nozzle Measure, Strainer, and Funnel Combined in..... 439
Oilcan, Flexible Spout on..... 933
Oilcan, Funnel Made from..... 769
Oilcans, Flexible Steel Spouts for..... 749
Oils, Imported, Laboratory Tests Determine Value of ..... 868
Oilstone, Circular Stone Made from..... 785
Oilstone, Dished, Carborundum Paper Used to Flatten ..... 142
Oleomargarine by Government Formula, British Factories Make..... 278
O'Neil, Lydia M. D.:
Brain Bower (Poem)..... 578
Steel (Poem) ..... 282
Onions, Woman Dons Army Gas Mask to Peel ..... 902
Opener, Can, Easy Operating..... 799
Operating Table for Hogs..... 584
Opossum, Live Bait Trap for..... 792
Orange or Grape Fruit Cover of Glass..... 754
Orchard Ladder, Self-Supporting..... 136
Orchard, Old, Transplanting of..... 777
Orchard, Strange, in Cañon..... 428
Orchard Trees, Fertilizing Cartridge Breaks Soil for ..... 282
Orchards, Fruit, Whirling Sprayer for..... 636
Orchards, War Swept, French Replanting... 252
Orchestra "Gun," Foot Pressure Shoots..... 249
Ore, Mine Owners Buy Aeroplanes to Carry. 116
Ore Smelters, Iron, Planned for Dutch East Indies ..... 744
Organs, Two, in Movie Houses, One Organist Plays Simultaneously ..... 918
Oven, Dutch, Directions for Making..... 786
Oven, Gas, Device Controls Gas Supply of... 434
Oven, Therapeutic, Human Ills Cured with.. 414
Oven, Warming, in Furnace..... 945
Oxidation of Molten Metals, Device Prevents ..... 517
Oxyacetylene Torch, Ten Ton Safe Cut Up with ..... 224
Oxygen—Mine Rescue Apparatus, Bureau of Mines Designs ..... 866
Oyster Farming in Washington Waters Creates New Industry, by L. W. Pedrose 211

Package and Newspaper Rack for Apartment Houses ..... 797
Packing Box for Stuffed Birds..... 191
Packing Cases for Europe, Kitchen Cabinets Made of ..... 375
Packing Fragile Articles, Rubber Hose Used in ..... 605
Pad, Warming, Electric..... 638
Paddle, Jumping Blocks Moved with..... 69
Pads, Chair Leg, Floor Protected by..... 620
Pads on Skate Strap..... 944
Page Call, Dots and Dashes Used as..... 485
Pail and Funnel, Combined, for Boat..... 313
Pail with Valve Bottom, Post Holes Bailed with ..... 151
Pails, Concrete, Flowerpots Molded in..... 124
Paint, Asphaltum, Auto Engine's Finish Renewed by ..... 461
Paint on Clothes, Chloroform and Blotting Paper Used to Remove..... 127
Paint on Metal, How to Remove..... 953
Paint Pots, Handle for Carrying..... 139
Paint, Rare Elements Discovered Suitable for ..... 426
Paint, Staircase, How to Coat with..... 452
Paint, Waterproof, Oil and Rubber Used to Make ..... 730
Paint, White, Factories Made Lighter by.... 739
Paintbrushes, Waxed Paper Keeps Soft..... 767
Painter, Hermit, Seashore Cottage of..... 732
Painters and Fruit Pickers, Hooks and Boxes for Ladder Aid to..... 450
Painters, Ladder Head for..... 774
Painting, American Soldiers Study in German School Building ..... 749
Paintings of Artists, Flax Seed Yields Limpid White Oil for..... 676
Palm, Aren, Submarine Cable Covering Made from Fiber of..... 367
Palm, Date, Brooms Made from Leaves of.. 434
Palm Leaf Fan, Flowers and Ribbon Trim.. 594
Palm Tree, Old, Transplanted as Civic Landmark ..... 224
Palms, Moving Picture People Plant Barren Isle with ..... 856
Pamphlets, Government Instructions on Accident Prevention Given in..... 385
Pan, Milk Drawn from Bottom of..... 315
Panama Canal Zone, Precast Roof Construction on Pier in ..... 832
Panorama Pictures, Ordinary Camera Takes 293
Pans, Enamel, Leaks Repaired in ..... 462

Digitized by Google

Paper, Aeroplane Glider Made of..... 146
Paper and Paraffin, Waste, New Process Salvages ..... 56
Paper, Cartridge Shells Used to Bind..... 940
Paper Clip as Key Ring..... 636
Paper Clip of String and Metal Strips..... 299
Paper Clips, Celluloid Windows Fastened in Auto Tops with ..... 135
Paper, Corrugated, Tools Prevented from Rusting by ..... 770
Paper Drinking Cup, Wire Stand for..... 959
Paper Envelope, Handle and Flap Fastener on ..... 698
Paper, Fiber of Baobab Tree Used to Make. 203
Paper, Grease Gun Substitute Made of..... 782
Paper Hangers—Wall Paper Borders, Cutting Out ..... 458
Paper Mill, Single Mechanism Handles Coal and Ashes in ..... 570
Paper Molds, Concrete Test Cylinders Made in ..... 896
Paper Phonograph Diaphragms ..... 158
Paper, Postage Stamp, Use Found for Waste ...
Paper Pulp, Yellow Pine Chips Used to Make 169
Paper Riveter and Punch, Combination..... 916
Paper Shelters for Flowers ..... 951
Paper Strip, Gummed, Sturdy Barrel Made of 384
Paper Tire for Motor Truck, Metal Tread on 598
Paper, Waxed, Paintbrushes Kept Soft by.. 767
Paper, Waxed, Paraffin and Pulp Reclaimed from ..... 848
Paper, Wet, as Fountain Pen Wrench..... 636
Paper, White, Keyholes Made Visible by.... 168
Paper, Wrapping, Holder for..... 782
Papier-Mâché Relief Map of Texas..... 894
Parachute, Propeller and Rudder on..... 432
Parade, "Ace of Aces" in, Floral Aeroplane in ..... 372
Parade, Doughnut and Coffeepot on Salvation Army Float in..... 12
Parade, Gas Record Shown by Shells Carried on Float in..... 203
Parade, Industrial, "Ship by Truck" Idea Promoted by ..... 822
Paraffin and Paper, Waste, New Process Salvages ..... 56
Paraffin and Pulp Reclaimed from Waxed Paper Waste ..... 848
Paraffin, Flowers Preserved in..... 933
Paraffin, Solid, Used in Facial Operations... 508
Parcel Post, Addresses Inside Packages Advised for ..... 98
Park Bench, Immovable, of Concrete and Steel ..... 756
Park, Canadian, Free Hot Water Supplied in 534
Park, Central, Seaplane "NC-4" Exhibited in 337
Park Gateway, Cheap Lumber Used for..... 297
Park Lagoons, Rescuing Outfits on Shores of 524
Park, Lincoln, Annex Built in Lake for.... 888
Park, Public, Picnic Party Lockers in..... 751
Park, Small Town Realizes Possibilities of, by G. Vestal ..... 819
Park, Yellowstone, Jackson Lake to be Included in ..... 324
Parks, National, Automobile Service between 264
Parrot and Cockatoo Industry, by J. E. Hogg 707
Parrot and Uncle Sam, Phonograph Records Carried by ..... 921
Partition, Movable, for Delivery Truck..... 765
Paste, Soldering, Dipper for..... 612
Pasteboard Fish, Oil Propels..... 796
Pasteurizer, Bottle Milk, Triple Use for.... 843
Patrol, Influenza, Camels Carry Food to.... 265
Paul, George F.:
Coal Stored under Water in Vast Pit..... 887
Demobilizing the Camels ..... 545
Subway Line in Madrid to be Opened.... 596
Pavement, Asphalt, Cobblestones Used as Base for ..... 913
Pavement, Billboard, Liberty Loan Campaign Uses ..... 58
Pavement, Wooden Block, Rainstorm Swells and Jumbles ..... 268
Pavements, Testing Drill Cuts Samples from 872
Pay Roll Plan in Theater, Bolsheviats Make Failure of ..... 413
Peace Conference Delegation, German, Corral Confines ..... 17
Peace Conference, Ink, Unbleached, Sent to. 2
Peace Medal, Treaty of Versailles Commemorated by ..... 368
Peace Treaty of Interest to American Inventors ..... 534
Peanut Stand, Automobile Disguised by.... 738
Pearls, Tripe Yields ..... 816
Pedal, Aluminum, Automobile Foot Throttle Operated by ..... 752
Pedal, Auto, Low Speed Latch for..... 461
Peddlers in Spanish Cities, Pine Cones Sold for Fuel by..... 349
Pedrose, L. W.:
Marathon Canoeist Makes Daring Trip... 661
Oyster Farming in Washington Waters Creates New Industry ..... 211
Pirates of the Silver Main..... 882
The Lure of the North Pacific..... 333
Pen, Drafting, Dotted or Full Lines Made with ..... 101
Pen, Fountain, Bottomless Pocket for..... 494
Pen, Fountain, Illuminating Battery in..... 888
Pen, Fountain, with Double Point..... 442
Pen, Ruling, Two Line..... 155
Pen, Typewriter Oiled with..... 775
Pencil Clip on Comb..... 618
Pencils and Pens, Holder for..... 115
Penholder, Gold, Schoolgirls Give French Premier ..... 220
Penholders, Bone, Convict Carves with Crude Tools ..... 762
Penmanship, Latest Style, Ancient Art Revived by ..... 709
Pennies, Two, and Brass Nut, Cigarette Lighter Made with ..... 219
Pens and Pencils, Holder for..... 115
Perambulator, Screened, for Baby..... 311
Perch, Baited, Wild Birds Attracted by.... 145
Perfume for Air of Room, Fan Distributes.. 312
Perfumes, Flowers in Home Garden Used to Make ..... 307
Perfumes, Storax Used to Manufacture..... 746
Pergola and Roof Garden on Garage..... 110
Pergola, Concrete, Hotel Grounds Adorned with ..... 584
Pergola Entrance, Bird Cages in..... 110
Pergolas, Wrought Iron, on Capitol Building Grounds at Washington ..... 90
Periscope Is Everyday Utility ..... 51
Periscopes, Rifle, Government to Put on the Market ..... 880
Phonograph, Beer Keg, Window Display Features ..... 325
Phonograph Diaphragms of Paper..... 158
Phonograph, Electric, Table Lamp Combined with ..... 275
Phonograph, Fireman Builds ..... 551
Phonograph, Miniature, Parrot and Uncle Sam Attached to..... 921
Phonograph Needle, Loud and Soft Tones Played with ..... 436
Phonograph Needle, Loud Toned, Used for Soft Tone ..... 316
Phonograph Needles, Fiber, Cutter for..... 319
Phonograph, New, Constant Speed for Records of ..... 918
Phonograph, Player Piano Case Contains... 37
Phonograph Record on Holder, Paper Sings Tune When Weighted Arm Is Swung on. 440
Phonograph, Record Repeated by..... 495
Phonograph Records, Carpet on Block Cleans 306
Phonograph, Sofa Arm Conceals..... 764
Phonographs, Dislike, Music Store Uses... 353
Phonographs, Presidential Campaign of 1920 to Use ..... 497
Phonographs, Unusual, Inventors Patent... 118
Phosphate Mines, World's Greatest, by James Anderson ..... 387
Phosphorus, Mines in Florida Yield, by James Anderson ..... 387
Photograph Printing Press, Pressman Devises ..... 353
Photograph, Unmounted, Camera Not Required to Copy ..... 785
Photograph, Vignette Effect for..... 477
Photographer, Improved Equipment for.... 861
Photographs, Colored, War Work Illustrated by ..... 71
Photographs, Medical Corps' War History in 708
Photographs of Battle Scenes, Bandit Raisuli Takes ..... 690
Photographs, Panorama, Ordinary Camera Used to Take ..... 293
Photographs, Smooth Background for..... 152
Photography, Aerial, School for Teaching.. 276
Photography—Aeroplanes, U. S. Map to be Made from Photographs Taken by..... 200

Digitized by Google

Photography—Aids in Photographing Machinery ..... 134
Photography—Artificial Moonlight, How to Make ..... 958
Photography—Boars, Wild, Camera Catches. 837
Photography—Camera, Hand, New Finder for ..... 648
Photography—Camera, Miniature ..... 143
Photography—Camera Plates, Method for Opening Box of ..... 793
Photography—Camera, Repeating, Takes No "Doubles" or "Blanks" ..... 833
Photography—Chute, Print Trimmings Carried to Waste Can on ..... 477
Photography, Comic Insect ..... 626
Photography, Dark Room Like Suitcase Aid to ..... 393
Photography—Film Clip ..... 797
Photography—Flares on Night Stunting Plane Make Vivid Picture ..... 86
Photography—Hand Camera, Focus with Full Size Image in ..... 485
Photography—Helmet on Statue of Liberty, Aeroplane View Shows ..... 872
Photography—Huge Colored Photographs Illustrate War Work ..... 71
Photography, Improved Equipment Used in. 861
Photography, Lamp Giving Nonactinic Rays for Use in ..... 524
Photography—Lens Cement, Emergency, White of Egg Used as ..... 154
Photography—Map Making Triple Camera for Aeroplanes ..... 726
Photography—Medical Corps' War History, Photographs Show ..... 708
Photography—"Mensurgraphy": A Photographic Method of Studying Deformities, by Robert H. Moulton ..... 361
Photography—Mid-Air Pictures of Persons. 304
Photography—Moonlight on the Water Scenes ..... 624
Photography—Negatives, Photo, Writing on 315
Photography—Negatives, Queer Study in Physiognomy Result of ..... 700
Photography—Old Aeroplane Box Makes Dark Room ..... 587
Photography—Perch, Baited, Wild Birds Attracted by ..... 145
Photography—Print Drier, High Capacity.. 955
Photography—Print Washer, Whirling Water ..... 150
Photography—Printing Frame Suspender... 787
Photography—Rare Picture of Wild Kangaroo ..... 601
Photography, Sanitarium Teaches Tubercular Patients ..... 736
Photography—Snails in Glass Tumbler Photographed by Texan ..... 172
Photography—Strange Traffic Record, Photographic Plate Makes ..... 216
Photography—Stuffed Bird Pictures, Curved Background for ..... 561
Photophone, Talks along Beam of Light with ..... 811
Physician, Aeroplane Used by ..... 107
Physician, Hospital Classification Proposed by ..... 331
Physicians, Army, Dreams of Shell Shocked Studied by ..... 229
Physiognomy, Two Negatives Produce Queer Study in ..... 700
Piano Keys, Celluloid Used to Repair..... 767
Piano Lamp for Edge of Top Board..... 114
Piano Tone Volume, Slots under Sounding Board Increase ..... 804
Picnic Party Lockers, Pasadena Public Park Has ..... 751
Picric Acid, Wool Used as Filters in Making 539
Picture Frames, Army Cartridges Used to Make ..... 435
Picture Hanging, Adjuster for..... 153
Picture Puzzles, Homemade..... 615
Picture, Thin Clock Has Frame below Face for ..... 754
Pictures and Letters, Navy Department Collects ..... 499
Pictures, Fire, Making..... 307
Pictures, Magazine and Paper Lantern Slides Made of ..... 304
Pictures of Stuffed Birds, Curved Background Used in Photographing..... 561
Pictures on Automobile, Artist Paints..... 200
Pictures, Panorama, Ordinary Camera Used to Take ..... 293
Pictures, "Star Spangled Banner" Taught with Aid of ..... 209
Pie Tin, Bubbling of Crust Prevented by Hole in ..... 151
Pier, Largest in World, Manila to Have.... 731
Pier No. 6, Cristobal, Precast Roof Construction on ..... 832
Piers, Bridge, Cement Containing Gypsum Satisfactory for ..... 77
Piers for Shipping Board, Municipality Offers ..... 510
Piers of Hamburg-American Line at Hoboken, American Government Purchases.. 52
Piers, Several, New York's Projected Harbor Improvements Include..... 485
Piers, Ship, at Angle, Space Problem Solved by ..... 563
Pig Iron, Germany Makes Steel Shell Cases Into ..... 181
Pigeon Hunters in Pyrenees, Odd Methods Used by ..... 891
Pigs, Cafeteria System for Dispensing Food to ..... 202
Pile Driver, Mobile, for Open Warfare..... 14
Piles, River House Boat Drydocked on..... 859
Pilgrim, Chinese, Travels in Strange Manner 544
Pilgrims' Pageant, "Mayflower" to Leave Plymouth, England, in..... 874
Pillar, Sigiri Rock, Is Old Fortress..... 825
Pillars, Concrete, Used as Mine Supports... ...
Pillars, Porch, Brick and Cement Used to Make ..... 111
Pillow, Spruce and Balsam, for Typewriter Muffler ..... 151
Pin, Corsage, and Casket, Mrs. Wilson Receives from People of Paris..... 254
Pin, Glass Headed Push, Student Carries for Coat Hook ..... 152
Pin Tray, Embroidery Hoops Used to Make. 793
Pine Chips, Yellow, Paper Pulp Made of.... 169
Pine Cones, Peddlars in Spanish Cities Sell for Fuel ..... 349
Pine Needles and Grass, Tent for Campers Made with ..... 315
Pine Stick, Lettering Done with..... 475
Pineapple Eyes, Shears for Removing..... 595
Pineapple Growers, Association Formed by. 747
Pinion, Shaper Used to Make..... 301
Pins, Wooden, File Clerk Uses to Locate Missing Papers ..... 776
Pipe, Builders' Level Made of ..... 782
Pipe, Concreted, Railroaded to River Bed... 376
Pipe Fittings, Die Stock from..... 615
Pipe Fittings, Post Tamper for..... 936
Pipe for Water, Huge, Wood Staves Used to Make ..... 437
Pipe, High Pressure, Repair of..... 931
Pipe Stand, Wire Used to Make..... 793
Pipe, Steel, Guard for Left Front Wheel of Automobile Made of..... 782
Pipe, Stove, Can Opener Used to Cut..... 785
Pipe, Tobacco, How to Season..... 638
Pipe, Tobacco, Metal Cover for..... 630
Pipe, Tobacco, Tightening Stem of..... 957
Pipe, Water, to Prevent Freezing of..... 939
Pipes and Fittings, Portable Hoist Made with ..... 781
Pipes, Cold Water, Ground Cork Coat Stops Condensation on ..... 214
Pipes, Double Eccentric Pipe Union for Joining ..... 438
Pipes, Water, Potash Used to Clean..... 924
Pirates of the Silver Main, by L. W. Pedrose 882
Piston Rings, Adjustable Tongs for Holding 132
Piston Rings, Tin Sleeve for Replacing.... 456
Pistons, Gasoline Engine, Tool for Fitting.. 778
Pistons of Magnesium, Aeroplane Engines Fitted with ..... 876
Pit, Vast, Slack Coal Stored under Water in 887
Pitchfork, Rotary, on Manure Loader..... 862
Pits beneath Track, Railroad Stops Oil Waste with ..... 335
Planing Machine, Portable, Electricity Operates ..... 488
Plant Disposal Department, Government Creates to Dispose of War Plants..... 209
Plant Specimens, Forest Rangers Collect.. 835
Plant Sprayer, Advertising Signs Made with 770
Planter, Potato, Furrows Dug by ..... 499
Plants, Doll's Dress Formed by..... 785

Digitized by Google

Plaster, Boat Made of ..... 426
Plate, Eating Utensils and Food Held on... 755
Plates, Camera, Method for Opening Box of. 793
Plates for Printing Mexican Money, Geometric Lathe Makes ..... 279
Platform, Garden, Planks on Inverted Flowerpots Form ..... 133
Platform, Ladder, for Painters..... 774
Platforms, Raised, Street Safety Zones Have 910
Play Window, Child's ..... 945
Player Piano, Phonograph Is Concealed in Case of ..... 37
Playground on School Building Roof, Chinese Children Taught Games on..... 600
Playing Cards, Talcum Powder Cleans..... 950
Pliers, Handy, for Turning Nuts..... 776
Pliers, Multiplex, Wood Whittler's Skill Shown by ..... 192
Plow, Stump Jumping, Hinge in Beam of... 592
Plowshare, Steel, Dinner Bell for Farm Made of ..... 462
Plug, Wooden, Rubber Hose Bushing for.. 292
Plumb Bob, Tapeline Attached to..... 456
Plumbing Fixture for Bathtub, Supply and Overflow Combined in ..... 753
Plywood, Waterproof, for Aeroplane Construction, by E. T. Bronsdon..... 419
Plywood, Woven Faces and Corrugated Core Form ..... 878
Pneumatic Hammers, Concrete Ship Tamped by ..... 325
Pneumatic Motors, Augers Operated by.... 747
Pneumatic Scraping Tool for Metal Castings 734
Pocket, Bottomless, for Fountain Pen..... 464
Pocket on Wall, Flowers in..... 464
Pocketknife, Tape Measure in..... 275
Poem—"Brain Power," by M. D. O'Neil.... 578
Poem—"Steel," by Lydia M. D. O'Neil..... 282
Poem—"Wings," by Charlton Lawrence Edholm ..... 24
Poison, Gas, Goats Used in Testing..... 503
Poison, Glazed Casseroles may Contain.... 203
Poison, Rat, Poultry Protected by Box Containing ..... 622
Pole, Fog Hidden, Aeroplane Wrecked by... 590
Pole, North, Aeroplane to Reach, by H. Egbert ..... 679
Pole, North, Discoverer of South Pole Seeks 741
Poles, Concrete Jackets Anchor..... 858
Police, Bombs to be X-Rayed by..... 552
Police, Coast City, Gambling House Doors Collected by ..... 32
Police, Crimes Indexed on Cards by..... 753
Police, Mounted, Carnival Crowds Thrilled by ..... 500
Policeman, Mounted, Quarry Pursued down Cellar Stairs by..... 672
Policemen, Lighted Signs Displace..... 696
Polish for Nickelplate, Kerosene or Gasoline Used as ..... 310
Polish, Metal, Valve Grinding Compound Used as ..... 776
Polish, Nickel, Banana Oil Preserves..... 465
Polish, Resin from Naphthols Used as..... 404
Pontoon Bridge, American Soldiers Build across Rhine ..... 716
Pontoon Equipment, Aeroplane Changed to Seaplane with ..... 668
Pontoons, Inflatable, Vessels Floated with.. 658
Pony, Papier-Mâché, on Motorcycle..... 408
Pony Swing for Child..... 441
Pool Ball Rack, Elevating..... 464
Pool, Wading, and Typewriter for Monkeys 812
Porcelain Shade, Electric Night Lamp Has.. 914
Porch Columns, Wooden, Cement Bases for. 445
Porch Pillars, Brick and Cement Used to Make ..... 111
Porches for French Dugouts, Huge Helmets Used as ..... 336
Port Holes, Pail with Valve Bottom Used to Bail ..... 151
Port, Ocean, Plans to Make Detroit an..... 871
Portable Arches, Concrete Bridge Building Simplified by ..... 753
Portable Hoist, Pipes and Fittings Used to Make ..... 781
Portrait Film, Draftsman's Erasing..... 959
Portrait of President Wilson, Artist Paints Holding Brush in Teeth..... 554
Portraits of Rulers of Allied Countries, Uruguay Postage Stamps Carry..... 704
Ports, Southern and Canada, Aeroplanes Link ..... 832
Post Office, No Letter Carriers for..... 828
Postage Stamps in Uruguay, Portraits of Rulers of Allied Countries on..... 704
Poster, American Library Association Uses. 752
Posters, War, of Every Nation, Exhibit of.. 202
Postmark, National Forests Advertised by. 342
Posts, Concrete, Hole in Ground Molds..... 248
Posts, Poultry House on ..... 294
Potash Deposits in Sicily, World's Dependence on Germany Removed by..... 220
Potash, Texas Oil Borings Examined for Deposits of ..... 89
Potash, Water Pipes Cleaned with..... 924
Potassium Salts, Chinese Salt Wells Yield.. 513
Potato Disease, Moving Pictures Show..... 752
Potato Flour, Production of..... 903
Potato Loader, Crop Carried from Digger to Wagon by ..... 80
Potato Peeler, Wire Brush Used as..... 462
Potato Peeling Machine for Moving Picture Show ..... 218
Potato Planter, Furrows Dug by..... 499
Potato Planter, Simple..... 291
Potatoes, Sweet, and Malt, Sirup Made of... 704
Potatoes, Winter Crop of..... 791
Poultry—Chicken Troughs, Pump Tubes Used to Make ..... 930
Poultry Feed Bin, Waste Prevented by.... 637
Poultry Food, Green, Wire Sling Holds..... 452
Poultry—Henhouse, Snake Trapped by China Egg in ..... 406
Poultry House Door, Hens Open..... 625
Poultry House, Lighting of ..... 926
Poultry House Nests and Roosts, Burlap Used on ..... 140
Poultry House on Posts, Space Saved by..., 294
Poultry House, Ventilation of..... 933
Poultry House Walls, Straw Reinforces... 605
Poultry Houses, Discarded Linoleum Weatherproofs ..... 779
Poultry Houses, Roost Windows in..... 454
Poultry Netting, Slotted Bolt Holds Staples While Putting Up..... 141
Poultry—Oat Sprouter, Lard Pail Used as.. 616
Poultry Purchases, Aeroplane Flies, Trailing ..... 229
Poultry, Rat Poison Box Protects..... 622
Poultry, Signboard of Farmer Advertises.. 544
Poultry—Simple Hover Increases Efficiency of Hens ..... 378
Poultry—Telescoping Chicken Coop, Protection Assured by ..... 122
Poultry—Tin Can Chicken Feeder..... 958
Poultry, Trappers Feed Wild Animal Carcasses to ..... 756
Powder Can Holder for Draftsman..... 136
Powder Puff, Handkerchief Pocket Conceals 435
Powder, Smokeless, by Clarence F. Allen.. 221
Powder, Smokeless, from Tree Stumps, War Development, by E. T. Bronsdon..... 549
Power House, Wing Fences Protect from Rock Slides ..... 418
Power Plant for Canoe..... 803
Power Plant, Hydroelectric, for Canadian Cities ..... 552
Power Plant, Hydroelectric, Victoria Falls to Have ..... 701
Power Plant, Nipigon River to Have..... 714
Power Plant, Portable, for Machine Shop.... 564
Power Plants, Hydroelectric, Iron Ore Smelters to be Operated by..... 744
Power Register, Drawbar Pull of Tractor Indicated by ..... 756
Preserving, Home, Americans Gone to France to Teach ..... 240
Press, Heavy Duty, Beams and Jack Used to Make ..... 772
Press, Wool Baling, Works While Sheep Are Sheared ..... 44
Preventoriums, Floating, by William D. Goodwin ..... 72
Print Drier, High Capacity ..... 955
Print Shop, Buffing Machine for..... 537
Print Washer for Photographs..... 150
Printers' Rollers, How to Make..... 936
Printing Frame, Photograph, Suspender for. 787
Printing Press for Photographs..... 383
Prisoner, Penitentiary, Bone Penholders Carved by with Crude Tools..... 762
Prize, Beauty, Girl Wins Golden Apple as.. 78
Prize, Club Offers for Name..... 800
Prize, Essay on Foreign Relations to Receive 418


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Prize for Air Flight, Portugal to Brazil.... 214
Prize for Air Trip Over Pacific, Moving Picture Producer Offers ..... 218
Prize for New York to Paris Nonstop Flight. 262
Prizes, Army Airmen Prohibited from Participating in Exhibitions for..... 119
Prizes for Emblem, American Legion Offers. 266
Prizes Offered for Essays on Artillery Subjects ..... 800
Profile, Lincoln's, Tin from Old Home Used to Emboss ..... 674
Prohibition—On the Trail of the "Hard Stuff," by E. T. Bronsdon..... 343
Projectile, Anti-Aircraft, Expands to Large Area ..... 693
Propaganda, German, Volume of Homer Conceals ..... 364
Propaganda System, German, Allied Armies Menaced with ..... 103
Propeller and Motor, Silent, for Aeroplanes. 168
Propeller, Marine, Revolves Parallel with Ship's Sides ..... 916
Propeller Shaft Bearings of Battleships, Lignum-Vitæ Used to Make..... 662
Propellers for Aeroplanes, Canvas Layers Used to Make ..... 868
Propellers, Wagon Loading Apparatus Fed by ..... 212
Protoplasm, Two Uncombining Substances Found in ..... 50
Protractor, Bevel, T-Square Has ..... 797
Protractor, Emergency, Watch Used as..... 462
Protractor, Ship Timbers Drilled by Drill Mounted on ..... 372
Pry Bar, Flooring Pulled Up with..... 460
Psychology—Cerebral Congestion Seen as Cause of Stammering ..... 256
Pulley, Belt Placed on with Rope..... 775
Pulley, Belt Put on with Sandpaper..... 793
Pulley for Toy Machinery ..... 307
Pulleys, Anchors on Fishing Boats Operated by ..... 313
Pulleys, Power, Belt Slipping Prevented by Magnetism in ..... 376
Pulp and Paraffin Reclaimed from Waxed Paper Waste ..... 848
Pump, Fertilizer Taken from Michigan Lakes with ..... 486
Pump, Huge, Relined by Oxyacetylene Process ..... 509
Pump, Irrigation, Gasoline Engine Operates. 718
Pump, Rotary, Motor Fire Engine Equipped with ..... 582
Pump, Single Moving Part for..... 429
Pump Tubes, Chicken Troughs Made of..... 930
Pumping Plant in Shelter House..... 960
Pumping Station, Sewage, Is Automatic.... 400
Pumps, Electric, Flooded Coal Mines Pumped Out with ..... 736
Punch and Die, for Flaring Gasoline Tubing 141
Punch, Blanking and Forming with..... 617
Punch, Center, with Spacing Device..... 939
Punch Holes, Original Centers Used in Enlarging ..... 127
Punch Press, Roll Feed Attachment Makes Automatic ..... 213
Punching and Shearing Machine..... 871
Pushcart, Juvenile Aeroplane Is..... 441
Pushmobile for Child ..... 441
Pushmobile, Wheel Steers ..... 920
Putting Green, Indoor Hole Converts Carpet into ..... 4
Putty, Nitric or Hydrochloric Acid Removes from Glass ..... 773
Puzzle, Dovetailed Block..... 467
Puzzle, Ring and Tangle..... 623
Puzzles, Picture, Homemade..... 615
Pyrometer, Automatic, Records of Ten Furnaces Kept by ..... 414
Pyrometer, Temperature Variations Indicated by Signals from..... 391

Quarries—Chute Hooks, Springs Support... 941
Quarry Carts, High Wheeled, Heavy Loads Carried by ..... 330
Quarry, Granite, in California, Nation Supplied by ..... 881
Quays, Genoa, Italy, to Build..... 748
Quicksands, Ship "Valbanera" Swallowed by 802

Rabbit, Cat Carries Home..... 281
Raccoon Trap, Mirror Bait for..... 319
Race, Air, around World, Sportsmen Plan... 880
Race, Air, "Flying Parson" First to Complete Longest, by Paul A. Jenkins..... 819
Race, Ancient Regulation Bars Horse from. 426
Race, Fathers Carry Children in..... 120
Race, Grass Mowing, Arguments Over Lawns Ended by ..... 424
Race in Air, International, Prince of Wales to Start ..... 432
Race Meets, Air Compressor Aids Motor Racers at ..... 427
Race, Submarine Chaser, Record Broken in. 745
Race, Swimming, at Paris, American Soldier Wins ..... 349
Race Track, Novel, for Kansas City..... 660
Race, Transcontinental, Aerial League Plans 719
Races, Yale-Harvard, Observation Cars Follow ..... 192
Rack, Baggage, for Automobile Running Board ..... 754
Rack, Circular Saws Provided with..... 121
Rack, Hinged, for Bottles ..... 609
Rack, Insulated, Meals Kept Warm in Transit in ..... 256
Rack in Tunnel, Electric Arc Used to Cut.. 526
Rack, Newspaper and Package, for Apartment Houses ..... 797
Rack, Newspapers Collected on..... 637
Rack, Overhead, for Auto Parts..... 614
Rack, Pool Ball, Elevating..... 464
Rack, Saw, Clothespins Used to Make..... 939
Rack, Shoe, Space Saved by..... 629
Rack, Simple, for Draftsman..... 604
Rack, Tobacco Pipe, Wire Used to Make.... 793
Rack, Tool, Bicycle Wheel Made into..... 773
Racks, Bicycle, for Shops..... 766
Racks, Tin Can Keys Used as..... 151
Radial Drill, Electric, Motor and Spindle on Arm of ..... 680
Radiation from Finger Tips Declared a Fact 68
Radiator, Auto, Preventing Freezing of..... 927
Radiator, Auto, Quick Repair for..... 292
Radiator Cap, Automobile, Vapor Condensed by ..... 728
Radiator Cap for Auto, Lock Protects Attachments on ..... 438
Radiator for Auto, Clamp for Workbench Holds ..... 597
Radiator Leaks, Auto, Rubber Tubing for... 945
Radiator, Ventilator Built behind..... 925
Radiators, Auto, Testing Repairs of..... 134
Radiators, Electric, Ships of U. S. Navy Heated by ..... 279
Radiators, Leaking, Acid Repairs for..... 477
Radium in Spring Waters, Instruments Affected by ..... 385
Radium, Paint Pigments Prepared from.... 426
Raft, Shiplike, Lumber, Towed Long Distance ..... 690
Raft, Two-Barge, Gas Tanks Towed Upstream on ..... 70
Raft, Woodsman's, Nails Not Used in Making ..... 474
Rafts, Life-Saving, False Ship Sides Form. 39
Railroad Accident—Logging Train, Runaway, Smash-Up of..... 258
Railroad Accidents Fewer during No Accident Week ..... 569
Railroad Administration, Summer Tourists Tickets Sold by ..... 16
Railroad, Automobile Motor Propels Street Car Trailer on ..... 750
Railroad, Canadian Pacific, Charter to Operate Aerial Freight and Passenger Service Applied for by ..... 171
Railroad Car, Freight Containers for..... 574
Railroad Cars, Electric, Small Semaphores Protect at Switches ..... 739
Railroad Cars Vault from Bridge..... 512
Railroad Coach, Locomotive Is One with... 498
Railroad Coal Cars, Oil Burners Used to Thaw ..... 532
Railroad Concrete Gondola Car, Tests of... 196
Railroad Construction Cars, Automobile Pulls ..... 748
Railroad Crossing, Pedestrians', Tunnel Obviates ..... 750
Railroad Crossing, Warning Sign for..... 910
Railroad Crossings, Passenger Trains Obstruct About Seven Seconds..... 673
Railroad Development in Jugo-Slavia American Financiers Backing..... 871

Railroad, Elevated, Trains in Rear End Collision ..... 731
Railroad Freight Car Door, Attachment Opens ..... 834
Railroad, Gasoline Propelled Trains on..... 568
Railroad Gondolas, Tilting Hoppers on..... 559
Railroad Grade Crossings, Acetylene Gas Signal for ..... 876
Railroad Gun Carriage, Service Test of..... 511
Railroad, Gunpowder to Operate Gun Hammer Used by..... 430
Railroad Locomotive Fire Box, Coal and Water Saved by Improved..... 122
Railroad Locomotive, Mechanical Stoker Feeds Coal to ..... 398
Railroad Locomotive Spark Arrester, Fire Claims Reduced by ..... 44
Railroad Men, One-Armed, Jobs in Signal Towers for ..... 85
Railroad, Narrow Gauge, Passenger Truck Runs on ..... 366
Railroad on Trestle over River, Concrete Pipe Brought on ..... 376
Railroad Passenger Coaches, Elevator Lifts Off Trucks ..... 565
Railroad Property Roofs, Locked Doors on Gangways Bar Trespassers from..... 396
Railroad Refrigerator Car, Automatic Cooling System for ..... 909
Railroad Rolling Stock, Concrete, Holland Constructing ..... 99
Railroad Signals, Painted Backgrounds for. 259
Railroad Speeders, Fire in American Camps Quenched by ..... 241
Railroad, Ten-Mile, Washington Timber Tract to Be Opened Up by..... 13
Railroad Ties, Special Cars Transport..... 840
Railroad Track, Locomotive Crane Transfers 662
Railroad Track Pits, Oil Waste Stopped by. 335
Railroad Tracks, Streams from Melting Snow Used to Sluice Snowslides from..... 433
Railroad Trailer Car for Sportsmen..... 416
Railroad Train, Unstable Trestle Crossed by 522
Railroad Water Tank, Locomotive Crane Lifts ..... 348
Railroad Wreck, Wooden Coaches Smashed in ..... 656
Railroad Yard Cinders, Plant for Handling. 427
Railroad Yard, Store in Silo in..... 800
Railroad Yard Workmen, Turnstile Advises Caution to ..... 102
Railroads, German, Engine, Dynamo, and Motor in Train Drive for..... 7
Railroads, Portable, Suitable for Branch Lines ..... 369
Railroads, Suburban of Berlin, Electrification of ..... 373
Railroads, Wharf, Genoa, Italy, to Build.... 748
Rails, on Runway, Wheelbarrows Guided by 108
Rain Gauge, Weekly Record Written by.... 895
Rain, Metal Canopy Protects Window from 638
Rainbow Colors of Insects, Scientists Explain ..... 14
Raincoat of Cyclist, Attachment for..... 959
Rainfall and Detonation, War Munitions to Determine Relation between ..... 576
Rainfall, Heavy, Cities in New Jersey Flooded by ..... 575
Rainstorm, Wooden Block Pavement, Expanded and Jumbled by..... 268
Rake, All Around, for Fruit Tree Cultivation ..... 138
Rake, Garden, Attachment for..... 616
Ramparts, Ancient, around Paris, Destroying ..... 870
Ranchmen, Rattlers Hunted with Sabers by 591
Range Finder, Model ..... 318
Range Finders, Naval, Improvements in.... 540
Range Finding Microphone, Hot Wire Telephone Used as ..... 680
Range, Rifle, Largest in America..... 738
Rangers, Forest, Plant Specimens Collected by ..... 835
Rasp, Wood, or Coarse File, Marble Chipped Off with ..... 288
Rat Poison Box, Poultry Protected by..... 622
Rat Trap, Collapsible Floor on..... 313
Rats and Mice in Belgium, Cats Wanted to Kill ..... 873
Rats, Casein, Glue on Aeroplanes Devoured by ..... 65
Rattlesnakes, Cavalry Sabers Used by Ranchmen Who Hunt ..... 591
Rawhide, Shaft Coupling Made of..... 608
Razor Blade, Chopper Made with..... 125
Razor Blade, Scraper Made of..... 925
Razor Blade Sharpening Shop Is 23 Inches Wide ..... 432
Razor Guard ..... 755
Razor Honing Frame for Safety Blades.... 452
Razor Strop Hook on Hat Hook..... 435
Razor Strop, Newspaper Serves as..... 795
Razors, Skin of Palm Used as Strop for.... 773
Real Estate Man, Log Cabin Used as Office by ..... 896
Record Cabinet, Phonograph, Sofa Arm Conceals ..... 754
Record Mileage, Bus' Solid Rubber Tire Establishes ..... 188
Red Cross Chapter, El Paso, Log Cabin Occupied by ..... 90
Red Gum Tree, Domestic, Substance Produced by Is Substitute for Storax..... 746
Reef, Coral, French Ship Aground on..... 230
Reel and Tightener for Clothesline..... 755
Reel for Wire and Rope..... 816
Refineries, Beet Sugar, New Process Aids... 848
Reflections in Store Windows, Chauffeur Locates Cars in Rear by..... 456
Refrigerating Machine for the Home..... 128
Refrigerating Plant, Hothouse Has..... 200
Refrigerator Car, Automatic Cooling System for ..... 909
Refrigerator Cars, Truck with Elevator Body Loads ..... 801
Refrigerator, Concrete, Microbes Find No Crevices in ..... 324
Refrigerator for Camp, Spring Water Used in ..... 465
Register, Drawbar Pull of Tractor Indicated by ..... 756
Register for War Tax Sales Compact and Simple ..... 214
Reindeer and Musk Ox, Explorer Designates Northern Canada as Favorable Grazing Land for ..... 62
Relay Switch with Mercury Contact..... 958
Relief Map of Texas, Resources Shown on... 894
Relish, Table, Pickled Seaweed as..... 268
Repair Equipment Stations, Electric Railroad Adopts ..... 229
Repair Record, Pacific Shipyard Makes..... 374
Repair Shop, Army Truck Carries..... 556
Rescue Contests, Mine Laboratories Opened with ..... 186
Reservation, Military, War Department Purchases Camp Grant Site as..... 416
Reservoir, Water Excavates ..... 560
Reservoirs, Engineers Plan to Equip River Nile with ..... 566
Resin from Knots in Pine Boards, Tin Roof Soldered with ..... 295
Resin from Naphthols, Shellac for Polishing Made from ..... 404
Restaurant, French, Misspelled Sign Increases Trade of ..... 710
Restaurant, Municipal, Cost of Living in France Lowered by ..... 187
Restaurant Sign, Electric, Steaming Coffee Cup on ..... 581
Reversing Switch, Push Button Operates... 138
Rice Fields, Mosquito Larvæ Destroyed by Oil Soaked Sawdust in..... 752
Rice Grower, Aeroplane Used by..... 484
Rice Thresher, Tractors Belted in Tandem Drive ..... 881
Rifle, Aeroplane, Universal Bearing Holds.. 759
Rifle, Air, Target Saves Shot..... 633
Rifle Barrel, Removing Rag from..... 625
Rifle Fire, Drifting Mines Destroyed by.... 495
Rifle, Mechanics of Sighting and Aiming... 478
Rifle Periscopes, Government to Put on the Market ..... 880
Rifle Practice—Why Shooting Downward Is Difficult ..... 954
Rifle Range, Navy, Largest in America.... 738
Rifle Range, Sporting Goods Store Has..... 823
Rifle, Semiautomatic, for American Army... 504
Rifle Sight, Sunshade for..... 306
Rifle, Steel Brush Shot Through to Clean... 598
Rifleman, Tricks of American in War, by Rex Harrow ..... 737

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Rime, Bridge Rules in..... 800
Ring and Cotter Pin, Ring Bolt for Canoe Made of ..... 310
Ring, Champion Airman Presented with.... 218
Ring, Identification Disk in Removable Signet of ..... 922
Rioters, German, French Battle Flags Destroyed by ..... 382
Riots, Fire Hose Used to Quell..... 99
River Bed, Board Floor Stops Erosion of... 682
River Bed Erosion, Jetties Stop..... 814
River, Buildings Destroyed to Widen Bed of 725
River Danube, Motorboat of Special Design for ..... 376
River Ford on Concrete Dam ..... 496
River, Mississippi, and Lake Pontchartrain, Canal to Connect ..... 490
River, Mississippi, Minnesota Cities Propose Highway along ..... 164
River, Mississippi, Seaplanes Tour..... 554
River, Mississippi, Taught to Brush Its Own Teeth, by H. H. Dunn..... 8
River, Missouri, Air Propelled Boats to Navigate ..... 385
River Nile, Engineers Propose Reservoirs for ..... 566
River, Nipigon, Hydroelectric Plant to be Built on ..... 714
River, Paraná, Hydroelectric Plant Proposed for ..... 703
River Seine, Test Transparency of Water of 909
River, Susquehanna, Coal in Form of Pebbles Pumped from ..... 54
River Thames, Fish Placed in..... 59
River, Vaal, Diamond Hunters in Diving Bells Search ..... 907
Rivet Heads, Catcher for..... 533
Rivet Holes, Electric Drill Used to Countersink ..... 508
Riveter and Punch, Combination..... 916
Rivets, Triple Gear, Anvil for..... 312
Road Building, Side Dumping Truck Bodies for ..... 89
Road Building, Terracing Machine Aid to... 57
Road, Concrete, Unbalanced Engines Used to Tamp ..... 406
Road Condition Reports, Weather Bulletins Include ..... 745
Road Construction Trucks, Broad Steel Tired Wheels on..... 246
Road Construction, Wind Helps Builders by Blowing Sand in ..... 246
Road, Costly, for New York State..... 904
Road Grading Machine, Horizontal Wheel Scraper on ..... 678
Road, International, to Connect Americas, Plan for ..... 352
Road Making Machine, Automobile Converted into ..... 709
Road Material Unloader ..... 763
Road Mirage, Auto Appears Double in..... 804
Road Roller, Steam, Soil Sterilized with.... 705
Road, Three Part, Concrete Put on in Strips 676
Road Workers, Landslides on Twin Peaks Furnish Occupation for ..... 87
Roads, Grade Crossing Plan Includes Safety Turnouts for ..... 117
Roads, Military, Three Mile Train of Trucks Crossing Continent to Demonstrate Need of ..... 372
Roads, Mountain, Loop Turns Improve..... 82
Roads, N. Y., Trees and Alfalfa to be Planted along ..... 902
Roads, Water Maker and Destroyer of, by Harlan H. Edwards..... 232
Roadside Camping Outfit for Autoists..... 712
Roadway, Bridge, Oil Treated Clay Used to Cover ..... 774
Roadway Contractor Uses Aeroplane to Inspect Work ..... 889
Rock Piles, Mountain Ascents Recorded by 542
Rock Pillar in Ceylon Is Old Fortress..... 826
Rock Slides, Wing Fences Protect Power House from ..... 418
Rocker, Low, for Child..... 441
Rocker, Toy, for Children..... 305
Rod, File Cleaner Made of..... 142
Rodding, Concrete Strength Increased by... 134
Rodents, Field, Carbon Bisulphide Gas Kills 771
Roller Bearing Has Staggered Rollers..... 579
Roller, Huge, Highway Road Construction Facilitated by ..... 520
Roller Skates, Rider's Weight Propels..... 592
Roller, Street, Mixer for Asphalt or Concrete Attached to ..... 202
Rollers, Farm Gate Rides on..... 445
Rollers, Printers', How to Make..... 936
Roof Bracket Seat Folds for Shipment..... 599
Roof Garden and Pergola on Garage..... 110
Roof of Building, Airman Lands and Takes Off from ..... 689
Roofs of Railroad Property, Locked Doors on Gangways Bar Trespassers from..... 396
Roof, Precast Concrete, Fits Together like Puzzle ..... 832
Roof, Sheet Metal, Curving Corrugation on, Prevents Snow Slides ..... 279
Roof Sign on Aerial Station, Fliers Guided by ..... 488
Roof Timbers, Test Preserving Methods for 902
Roofs, Shingled, Tents Serve Entire Year Equipped with ..... 596
Roost Windows in Poultry Houses..... 454
Rope and Wire, Reel for..... 816
Rope, Belt Placed on Pulley with..... 775
Rope, Gun Cleaned with ..... 475
Rope Making, Aren Palm Fiber Used for.. 367
Rope, Manila, How to Test..... 927
Rope Workers, Blind, Skill Displayed by... 585
Rosary, Bracelet Adorned with..... 435
Rose Carnival, 16,000 Roses Used in Window Display for ..... 201
Rosin, Babbitt Blowholes Prevented by..... 797
Rowboat, Plaster Used to Make..... 426
Rowboats, Deflated, Carried in Hand..... 642
Rubber and Oil, Waterproof Paint Made from ..... 730
Rubber Band, Child's Monoplane Dart Shot with ..... 443
Rubber Band on Hammer, Woodwork Protected by ..... 453
Rubber Bands, Furniture Gluing Aided by.. 792
Rubber Cement, Auto Tires Mended with... 157
Rubber Corks as Vibration Absorbers..... 157
Rubber Crutch Tip, Hammer Head Fitted with ..... 777
Rubber Doll, Britain's Premier Modeled as.. 236
Rubber Gaskets, Old Tires Used to Make... 791
Rubber Hose Bushing for Wooden Plug.... 492
Rubber Hose, Fragile Articles Packed with. 605
Rubber Noise Absorber for Auto Doors..... 442
Rubber Shipment, Train Filled by..... 122
Rubber Sole Tip for Chauffeur's Shoe..... 914
Rubber Sponge, Shaving Brush Made of..... 133
Rubber Stamp, Multiple, Is Adjustable..... 146
Rubber Suction Cups on Back of Nail Brush for One-Armed Person..... 275
Rubber Tire, Solid, Record Established by.. 188
Rubber Tubing for Auto Radiator Leaks... 945
Rudder, Motorboats Turned, Stopped, Reversed with ..... 261
Ruins of Building, Balloons Nest in..... 93
Rule and Hammer Trick..... 955
Rule, Draftsman's, Circles Drawn with..... 285
Rule, Folding, Square Made of..... 137
Rule on Anvil ..... 771
Rule, Screw Cutting Lathe Makes Graduations on ..... 460
Rules, Bridge, in Rime..... 800
Ruling Pen, Two Line..... 155
Rungs, Chair, Steel Rings Prevent Slipping Out of ..... 123
Runner Cutter, Strawberry Beds Weeded Out by ..... 125
Runners, Egg Shaped, for Snow and Ice Automobile ..... 1
Running Board, Automobile, Wire Basket on for Dog..... 787
Runway, Sloping, Hospital Stretcher Cases Carried up ..... 96
Rushes, Concrete Ships Reinforced with.... 693
Rust, Corrugated Paper Protects Tools from 770
Rust Proof Metallic Coatings for Iron, Circular Discusses ..... 534
Rust Proof Process for Iron, Swiss Scientist Discovers ..... 378
Rust, Salvaging Tools Covered with..... 456
Rust, Steam Bath Makes Iron Proof against 118

Sabers, Cavalry, Ranchmen Hunt Snakes with ..... 591
Safe, Pocketknife Used to Carve..... 748
Safe, Ten Ton, Oxyacetylene Torch Used to Cut Up ..... 224

Digitized by Google

Safe, Yeggmen Burn Hole in with Acetylene Torch ..... 831
Safety Match Boxes, Inexpensive Coating Found for ..... 810
Safety Match Scratcher on Ash Tray..... 915
Safety Pin, Hinge on Lid of Coffeepot Repaired with ..... 473
Safety Razor Blades, Honing Frame for..... 452
Safety Razor, Guard Converts Ordinary Razor into ..... 755
Sailors and Soldiers, Farm Training for.... 555
Sailors at Sea, Wireless Music Entertains... 251
Sailors, Competent, Merchant Marine Students Become ..... 697
Sailors, Dead, Flower Laden Ship Sunk as Tribute to ..... 405
Sailors, Handcuffed to Bicycles, Continental Trip Made by ..... 253
Sailors, Rigging of Aerial Ride in Amusement Park Mended by ..... 550
Sailors, Tailor Presses Clothes While Swim is Taken by..... 241
Sale, Fire, Building Constructed for..... 839
Salesman, Auto, Demonstrating Engine Mounted on Car by..... 396
Salesman, Automobile Body for..... 925
Salesmanship, Tire, Traveling Experts Teach 740
Salesmen in France, American Identification Card Needed by..... 909
Salmon, Alaskan, Petition for Protection for Spawning Grounds of..... 65
Salmon Canneries, Floating, on Scows..... 548
Salmon Fisheries, Pirates Prey on, by L. W. Pedrose ..... 882
Salt Crystal, Rochelle, Batteries in Telephone Circuits Replaced by..... 184
Salt Manufacturers, Chinese, Queer Caldrons Used by ..... 860
Salt Shaker, Toothpick Holder Made of..... 464
Salt Water, Eggs Tested in..... 159
Salt Wells, Chinese, Potassium Salts Found in ..... 544
Salts, Radioactive, in Lightning Arrester... 62
Salvage—Barbed Wire, Battle Fields to Give Up ..... 84
Salvage—Crane Hooks, Scrapped Ship Plates Used to Make ..... 727
Salvage—Ocean Bed Explored by Submarine ..... 482
Salvage of Barbed Wire, Baling Machine Used for ..... 335
Salvage of Solder, Basin of Water Accomplishes ..... 777
Salvage of Trench Hose in England..... 717
Salvage of Tug by Lighter..... 529
Salvage Problems, Post-War, New Devices Developed by, by H. W. Norfolk..... 658
Salvage—Rust on Steel Tools, Removing... 456
Salvage, Ships Built of Concrete for..... 371
Salvage—Steamer, Stranded, Empty Barrels Used to Float..... 330
Salvage—Ventilators of Subway, Angle for Lost Articles in..... 422
Salvage—Warships, Italian, Retrieved from Sea ..... 890
Salvage—Waste Paraffin and Paper Saved by New Process..... 56
Salvarsan, Dye Laboratory Source of..... 863
Sand Block, Commutators Polished with.... 449
Sand, Flowers Preserved by..... 770
Sand for Locomotives Supplied like Water... 905
Sand Pumped from Sea, Coast City Garbage Covered with ..... 363
Sand Road Construction, Wind Helps in.... 246
Sand Scars on Soft Castings, Dipping in Cold Water Removes..... 465
Sandpaper, Grease and Dirt Removed from Carborundum Wheel by ..... 765
Sandpaper, Tight Belt Put on with..... 793
Sandpaper, Whetstone Held by..... 934
Sandstone, Miniature Castle Carved in..... 559
Sandwiches, Automobile Fitted to Sell..... 580
Sanitarium, Tubercular Patients Learn Trades in ..... 736
Saw and Ax, Guards for..... 936
Saw, Band, Electric Motor Drives..... 727
Saw, Circular, Teeth Inserted in..... 424
Saw, Circular, Workmen's Fingers Saved by Guard above ..... 257
Saw Clamp, Sticks Used to Make..... 451
Saw, Crosscut, Brace for..... 621
Saw Frame, Elevator for..... 933
Saw—Mirror on Hacksaw Blade..... 452
Saw Rack, Clothespins Used to Make..... 939
Saw—Right Angle for Cutting Found by Reflected Light from..... 310
Saw—Square Holes Cut with Hacksaw..... 621
Saw, Swinging, Locks Away from Operator. 863
Saw, Wood, Windmill Wheel Operates..... 508
Sawdust and Soda, Fires Extinguished with [illegible]
Sawdust, Fire Resisting Brick Made from... 238
Sawdust, Oil-Soaked, Mosquito Larvæ Destroyed by in Rice Fields..... 752
Saws, Circular, Rack for..... 127
Scale, Balance, Level Base Not Necessary for Working of..... 6
Scale on Anvil..... 771
Scale, Portable, Hogs Weighed on..... 838
Scale, Postal, Homemade..... 798
Scarf Pin, Champion Airman Presented with 518
Scenery—Balanced Rock, Base Concreted to Save ..... 198
School, Aerial Photography Taught in..... 276
School Building, German, American Soldiers Study in ..... 749
School Children, Chinese, Playground on Roof for ..... 600
School, Day, for Adults..... 692
Schoolgirls, Penholder Given French Premier by ..... 220
Schoolhouse on California Beach..... 120
Schools, French, Ambidexterity to be Taught in ..... 6
Schools, Growing Population Taxes Capacity of ..... 95
Schools in Cincinnati, Jewelry Designing Taught in ..... 566
Schools, Memorial, World War Veterans to be Honored by..... 713
Scientists, Influenza Germ Searched for by 908
Scientists, Memorial to James Watt Planned by ..... 590
Scientists, Motion of Electrons in Atom Denied by ..... 244
Scientists, Prehistoric Village of Eskimos Unearthed by ..... 901
Scientists, Rainbow Colors of Insects Explained by ..... 14
Scientists, Valley of 10,000 Smokes Studied by ..... 259
Scientists, Volcanic Vapors of Alaskan Smoke Valley Explained by..... 564
Scissors, Glass Cut under Water by..... 779
Scoop Loader, Self-Propelling, for Mines... 219
Scout, Sea, Movement, England Birthplace of ..... 601
Scows, Salmon Canneries Built on..... 548
Scraper, Center, for Lathe Work..... 778
Scraper, Foot, Scrap Iron Makes..... 956
Scraper, Razor Blade Used as..... 925
Scraper, Road, Automobile Converted into. 709
Scraper Wheel, Horizontal, Road Grading Machine Has ..... 678
Scraping Tool, Mechanical, for Metal Castings ..... 734
Scratcher, Wire Mesh, on Match Box..... 305
Screen, Baby Perambulator Inclosed with... 311
Screen Door Hook, Switch Formed of..... 288
Screen Door, Panels Make into Storm Door. 116
Screen Doors, Sagging of Prevented..... 159
Screen for Auto Windshield, Insects Kept Out by ..... 886
Screen, Grate Fire..... 777
Screens, Automatic, for Street Car Windows 219
Screwdriver, Bolt Held with..... 457
Screwdriver—Compressed Air Trick..... 629
Screwdriver, Spring Grip on..... 138
Screws, Cardboard Holds for Starting..... 622
Screws, Motor Driven, Anchor Chain Shackles Tested by ..... 170
Scrubbing and Floor Polishing Machine..... 844
Scrubbing Machine, Carpets Cleaned on Floor with ..... 873
Scrubbing, Sponge Mitten and Wringer Aid in ..... 157
Sculptor, Foch Carved in Soap Bar for Window Display by..... 56
Sculpture—Head of Lincoln, Largest..... 337
Sculpture—Statue of American Soldier Shows Spirit of Exposition..... 210
Sculpture—Statue of Lincoln for City of Manchester ..... 811
Sea, Age of Is 90,000,000 Years..... 717
Sea Lions, U-Boats Tracked by..... 2

Digitized by Google

Sea Shell Beads Unearthed in Mound Builder's Tomb ..... 688
Sea Water, Dough Mixed with..... 567
Seal Bones, Fossil, Tractors Go to Pribilof Islands to Haul..... 70
Seal, Boy Finds in Delaware Bay..... 281
Seal, Dog Mothers..... 281
Seals of States, Hardware Stock Produces... 695
Seals, Lead, Electric Machine to Cast..... 573
Seaplane Bases, Floating, for Transoceanic Air Travel ..... 847
Seaplane Crash at Naval Air Station..... 28
Seaplane, Deep Sea Fishing Simplified by... 481
Seaplane Eclipse Expedition, Misfortune Hounds ..... 329
Seaplane, First Commercial Flight to Cuba Made by ..... 194
Seaplane for Passenger Trade, Largest, Brothers Build ..... 576
Seaplane Hangars, Fireproof, at Water's Edge ..... 547
Seaplane "NC-4," City Park Displays..... 337
Seaplane "NC-4," Transatlantic, England Visited by, by Paul A. Jenkins..... 205
Seaplane, Pontoon Equipment Changes Aeroplane to ..... 668
Seaplane, Repair Men of Panama Canal Carried on ..... 560
Seaplane Station, Seagoing Fuel Carts Used at ..... 583
Seaplane Tours to Brazil and Philippines, Navy Plans ..... 896
Seaplane, World's Altitude Record Made by. 862
Seaplanes and Submarines, Radio Experiments Indicate Coöperation between..... 648
Seaplanes, Fish Located by..... 802
Seaplanes for the Congo, King Albert of Belgium Purchases ..... 533
Seaplanes, Mississippi River Toured by.... 554
Seaplanes, Naval, Electric Starters Supplied for ..... 245
Seaplanes, Signals Sent by Electrodes in Sea between ..... 278
Seaport for Switzerland, Italian Proposes... 414
Seaport, Italian, Improvements of..... 748
Searchlight, Aerial, Dissection Work Projected by ..... 745
Searchlight, Auto, Repair of Tires Aided by Clamp for ..... 287
Searchlight, Road Mirror, and Flag Holder for Automobiles ..... 755
Seashore Cottage, Hermit Painter Lives in.. 732
Seat, Bracket, for Roof Folds for Shipment. 599
Seat, Extra, for Closed Auto..... 939
Seat, Garden, Stump Supports..... 465
Seaweed, Fibrous, Insulating Material Made from ..... 523
Seaweed, Pickled, as Table Relish..... 268
Seed, Sweet Clover, Tin Can Used to Gather. 792
Seedlings, Wick Waters..... 291
Seines, Shark, Marine Leather Production Aided by ..... 675
Selenites of Lead and Barium, Paint Pigments Made from..... 426
Selenium Cell, Fire Alarm, Light of Flames Operates ..... 224
Selenium, Paint Pigments Made from..... 426
Semaphore, Traffic, Motor and Clockwork Operate ..... 880
Semaphores, Small, Electric Railroad Cars Protected by ..... 739
Sepulcher, Mound Builders', Trinkets Found in ..... 688
Sewage Pumping Station, Automatic..... 400
Sewage Water, British Mills Purify and Use 372
Sewer, Ocean, Success Follows Failure in Laying ..... 174
Sewing Machine Belts, Coil Spring Coupling for ..... 138
Sewing Machine, Early Model of..... 417
Sewing Machine, Electric, Closes like Desk.. 914
Sewing Machine, Emery Wheel Belted to.... 630
Sewing Machine, Jig Saw Made of..... 629
Sewing Machine, Typewriter Stand and Copy Rack from ..... 638
Sewing Machines, Improved, Factory Time Saved by ..... 897
Shackles, Anchor Chain, Motor Driven Screws Test ..... 170
Shade, Light, Inversion of Gives Indirect Illumination ..... 786
Shade, Silhouette, for Nursery Lamp..... 915
Shaft Coupling, Flexible, Woven Fabric Used to Make..... 44
Shaft Coupling, Rawhide Used as..... 608
Shaft, Flywheel Reversed on..... 286
Shaft, Worn, Building Up by Welding..... 942
Shaper, Fixture Changes to Grinder..... 927
Shaper, Motor Drives Spindles Direct on.... 423
Shaper, Pinion Machined on..... 301
Shark Hide, Diamonds Polished with..... 591
Shark Seines, Marine Leather Production Aided by ..... 674
Sharpshooter, American, Tricks of in War, by Rex Harrow..... 737
Shaving Articles, Aluminum Case Holds..... 922
Shaving Brush, Rubber Sponge Used to Make 133
Shaving, Mirror as Aid in..... 467
Shavings in Auger Holes, Removing..... 604
Shearing and Punching Machine..... 871
Shears, Electric, Speed and Safety Combined in ..... 405
Shears, Glass Cut under Water by..... 779
Shears, Pineapple Eyes Removed with..... 595
Sheathing, Metal for Houses..... 858
Shed, External Clapboard Covered Braces for ..... 656
Sheep Dip, City Streets Washed by Sprinklers with..... 433
Sheep, European Battle Fields for Grazing.. 375
Sheep Herder, Home of, by Frank R. Arnold 189
Sheep Shearing, Wool Baling Press Works during ..... 44
Sheepmen, French, Stilts Used by..... 875
Sheet Metal Joined without Rivets..... 137
Sheet Steel Stamping, Gasoline Engine Made of ..... 439
Shelf and Table, Combination..... 637
Shelf Cabinet, Spools Used to Make..... 630
Shelf for Books, Hanging..... 476
Shelf for Filing Cabinet, Drawer Handle Supports ..... 662
Shell Cases, Steel, Germany Makes into Pig Iron ..... 181
Shell Mound, Indian, Florida Builds Observation Tower on..... 91
Shell Shocked, Clue to Cure Given by Dreams of ..... 229
Shell, World's Largest, British Naval Gun Fires ..... 216
Shellac, Gloss Restored to Straw Hats by.... 787
Shellac, Shoe Laces Retipped with..... 155
Shellac, Squash Preserved by Coat of..... 610
Shells, Discarded, Lifting Magnet Unloads.. 692
Shells, Large Caliber, Timber on Russian Farm Land Cleared by..... 340
Shells on Float, Gas Record Shown by..... 203
Shelter House, Pumping Plant in..... 950
Shelters, Paper, for Flowers..... 951
Shepherds, French, Stilts Used by..... 875
Shield, Western Chef Molds of Dough..... 893
Shields, Fire Rangers' Eyes Protected from Mountain Glare by ..... 55
Shifter, Belt, Acts at Two Points..... 726
Ship—Battleship "New Mexico," Electric Motors Drive ..... 648
Ship—Battleship "Tennessee" Is America's Largest ..... 84
Ship Canal, Finland Plans..... 671
Ship Canal in New Orleans, Harbor Facilities Offered by..... 490
Ship Captain, Deranged, Crew Perilled by .. 504
Ship Captain, Swedish, Floating Mine Dissected by ..... 373
Ship, Cargo of Meat for Europe from Chicago Sent on..... 442
Ship, Concrete, Beach Pounding Does Not Harm ..... 241
Ship, Concrete, Built for Salvaging..... 371
Ship, Concrete, Compressed Air Hammers Tamp ..... 325
Ship, Concrete, Launching of at Mobile, Ala. 719
Ship, Concrete, Sides Built in Flat Precast Units for ..... 331
Ship, Demountable, Lumber of Cargo Used to Build ..... 162
Ship, Department Store for British Navy on. 92
Ship, Drawbridge, Damaged by..... 119
Ship, Farragut's, Church Lawn to be Adorned with Mainmast of..... 877
Ship, Floating Preventoriums on..... 72
Ship, Floral, Shipbuilder Honored with..... 99
Ship, Flower Laden, Sunk as Tribute to Dead 405
Ship "Furious" Is Floating Aerodrome..... 430


Digitized by Google

Ship, Great Lakes, Record Coal Cargo Carried by ..... 670
Ship, Heroic Rescue in Gas Filled Hold of... 692
Ship Hull, Wood and Steel Combined in..... 904
Ship, Iceberg Hit by..... 878
Ship "Imperator," German, Kept by U. S.... 886
Ship, Italian, Retrieved from Sea..... 890
Ship "Kersaint" Aground at Society Island Reef ..... 230
Ship, "Lake Fugard," Slides into Water Ready for Voyage..... 521
Ship, Life Saving Rafts from False Sides of 39
Ship, Mammoth, Withdrawn from Transport Service ..... 508
Ship, "Mayflower," to Leave Plymouth, Eng. 874
Ship—Naval Electricians Trained on Dry Land Battleship ..... 829
Ship, Negro Women Carry Coal on..... 577
Ship—Old German Yacht Cut Up as Junk... 383
Ship Piers at Angle, Space Problem Solved by ..... 563
Ship Plates, Scrapped, Crane Hooks Made from ..... 727
Ship, Scuttled, Locomotives Raise..... 74
Ship—Steamship Service between Rio de Janeiro and San Francisco..... 6
Ship, Stranded, Empty Barrels Used to Float 330
Ship—Submersibles, Oil Burning, may Alter British Navy ..... 828
Ship Timbers, Drill Mounted on Protractor Used on ..... 372
Ship—Troop Berths, Transport's Cross Section Shows ..... 238
Ship, Two Masted, Dyewood from Argentina Brought by ..... 86
Ship, "Valbanera," Quicksands Swallow.... 802
Ship Welding Set, Truck Carries..... 812
Ship—Western Chef Makes Cake like..... 893
Ship, "Western Knight," Disastrous First Voyage of ..... 551
Ship, Whaling, Explosive Harpoons Used by 397
Ship, Woman Pilots on Mississippi River.... 56
Shipboard Laboratory, Diseases of Tropics to be Studied in..... 542
Shipbuilders, Chinese, First Fabricated Steamship Completed by..... 399
Shipbuilders, Pneumatic Tool Suspender Tested by ..... 824
Shipbuilding—Giant Trees Used to Make Derrick for Lifting Ship Boilers..... 542
Shipbuilding, Green Wood, The Fallacy of, by L. W. Pedrose..... 513
Shipbuilding—Hull, Wood and Steel Combined in ..... 904
Shipping—America's Merchant Marine Quadrupled during War..... 704
Shipping Board, Municipality Offers Piers to 510
Shipping Cage, Birds Travel Comfortably in 430
Ships—Aerial Photographs of Pacific Fleet 526
Ships, Austrian, How Italians Sunk..... 710
Ships, Brazilian, France to Release..... 6
Ships, Concrete, Rushes Used to Reinforce.. 693
Ships—Dock, Concrete, London Has..... 714
Ships—Dreadnaught Plans, War Lessons Reflected in ..... 216
Ships—Eagle Boats on Way to Russia..... 527
Ships, Enormous Month's Tonnage of..... 161
Ships, Government Built, Shipping Board Sells ..... 408
Ship's Hollow Fin, Motor and Propellers in. 714
Ships, Meter Gauges Visibility of..... 815
Ships—Navy, Peace Time, Three Fleets Now Compose ..... 412
Ships, Ocean, Oil to be Burned by..... 809
Ships of Emergency Fleet, Green Timbers Ruin ..... 64
Ships of U. S. Navy, Electric Radiators Heat ..... 279
Ships, Panama Canal Has Drydocks for..... 711
Ships—Pier, Largest in World, Manila to Have ..... 731
Ships, Sail Rigged, Motorboats Made of..... 874
Ships, Shipyard Reduces Cost of Building... 378
Ship's Sides, Propeller Revolves Parallel with ..... 916
Ships, Steam Auxiliary Condenser Used to Cool Oil on..... 739
Ships, Steam, Sail from Mobile, Ala., to European Ports ..... 738
Ships, Sunken, Collapsible "Camels" Used to Raise ..... 171
Ships, Sunken, New Methods of Raising..... 658
Ships, Ten Deck, for American Service..... 830
Ships—The Fallacy of Green Wood Shipbuilding, by L. W. Pedrose..... 513
Ships, Toy, Japanese Children Make..... 761
Ships—Warships Interned at Scapa Flow, German Crews Scuttle..... 369
Ships—Warships, Targets and Junk Made of 587
Shipworms, Panama Canal Infested with.... 868
Shipyard, Cost of Building Ships Reduced by 378
Shipyard, Hammerhead Crane Serves Two Shipways in ..... 266
Shipyard, Pacific, Repair Record Made by... 374
Shipyard Workers, Noon Hour Band Concerts for ..... 367
Shipyards, American, Foreign Contracts Accepted by ..... 251
Shipyards, American, Production Record Set by ..... 734
Shipyards, English, Launching Device Tested by ..... 571
Shock, Corn, Binder..... 764
Shock Recorder for Aeroplane Promises New Instrument ..... 654
Shoe Laces, Shellac Used to Retip..... 156
Shoe Leather, Blocks on Feet Save..... 888
Shoe Paste, Keep on Valve Wheel of Radiator to Soften ..... 464
Shoe Polish, Furniture Refinished with.... 466
Shoe Rack, Space Saving..... 629
Shoe Soles, Varnish Used to Preserve..... 791
Shoe, Spade Prevented from Cutting..... 620
Shoe Tongue Kept from Slipping..... 156
Shoe Trade, Value of Tanned Goat Skin Used by ..... 752
Shoes, Foot Strengthening Device Worn over ..... 758
Shoes, Oats for Stretching..... 447
Shoes, Old, Road Composition Includes..... 687
Shoes, Record Size, for Circus Woman..... 836
Shoes, Strips Applied to Soles Prevent Wear on ..... 118
Shoes, Support for Polishing..... 632
Shoot-the-Chutes, Homemade ..... 148
Shop for Sharpening Razor Blades Is 23 Inches Wide ..... 432
Shop Motors on Ceiling, Installing..... 298
Shop on Ship for British Navy..... 92
Shop, Tap and Drill Stands Simplify Work in ..... 433
Shop Trestles, Legs Mounted on..... 141
Shops, Ship Repairing, Panama Canal Has.. 711
Shorthand, Newspaper for Indians in..... 842
Shot, Air Rifle Target Saves..... 633
Shot, Stray, Wild Ducks Killed by Diet of... 705
Shotgun, Why Shooting Downward Is Difficult ..... 954
Shovel Grip, Handle for Door Made from... 301
Shovels, Steam, Bunkers Used by Excavating Contractors to Keep Busy..... 735
Showcases, Russians Use as Museums..... 728
Shower Bath for Mine Mules..... 14
Shower Bath Stall, Bathroom Fitted with... 405
Shrub, Desert, Alkaloid Yielded by..... 919
Sighting and Aiming, Mechanics of..... 478
Sign, Caddies' Golf Ball Trade Stopped by.. 372
Sign, Danger, University Builds..... 111
Sign, Electric Fan Displays..... 941
Sign, Electric, Wisconsin Capitol Has on Dome ..... 751
Sign Holders, Film Spools Used to Make.... 147
Sign, Mechanical, Shows Danger of Careless Automobile Driving ..... 719
Sign, Misspelled, Café Trade Increased by... 710
Sign, Misuse of Fire Bucket Prevented by...931
Sign on Roof of Aerial Stations, Fliers Guided by ..... 488
Sign, Victory Loan, Iowa Erects..... 97
Sign, Warning, on Lincoln Highway..... 751
Signal, Acetylene Gas, for Grade Crossings.. 876
Signal Boards for Traffic, Truck Equipped with ..... 599
Signal Corps Experiments, Telephone-Telegraph Messages Sent Simultaneously in.. 14
Signal Corps, U. S., Chance to Learn Operations of ..... 668
Signal Corps, U. S., 68,000 Miles Outpost Wire Used a Month by..... 13
Signal Lamp for Electric Iron..... 475
Signal Tower, Steel, Storm Warnings Given by ..... 893
Signal Towers, Jobs for One Armed Men in.. 85
Signals between Air Craft, Electrodes in Sea Send ..... 278
Signals, Fog, Lighthouse Wireless Sends... 842


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Signals on Railroads, Painted Background for ..... 259
Signboard, Novel, Farm Products Advertised on ..... 544
Signboard, Tennis Players Appealed to by.. 740
Signboards, Sculpture Used on..... 91
Signet Ring, Identification Disk in..... 922
Signs, Advertising, Plant Sprayer Used to Make ..... 770
Sign, City will Construct for Air Craft..... 734
Signs, Lighted, Policemen Displaced by..... 696
Signs on Autos, Cautious Driving Urged by. 378
Signs on Wisconsin Trunk Highways, Autoists Aided by..... 52
Signs, Pine Stick Used to Paint Letters on.. 475
Silk Cartridge Cloth, Peace Time Use of..... 386
Silkworms, Butterfly Farmers in France Experimenting with ..... 883
Silo Blocks, Concrete, Bridge Arch Made of. 62
Silo, Combined Door and Ladder Late Improvement of ..... 559
Silo in Railroad Yard, Store in..... 890
Silver, Lost, Electrical Precipitation Saves.. 518
Silver, New Vault Building Asked for..... 848
Sink Drain, Automobile Heater Made from.. 149
Sink or Drain Pipes, Plugged Up, Gasoline Used to Clean..... 447
Siphon in Tank, Starting Flow of Gasoline with ..... 452
Siren, Electric, Army Bugle Replaced by.... 50
Sirup, Sweet Potatoes and Malt Used to Make ..... 704
Skate Strap, Pads on..... 944
Skater, Ice, World's Record Established in Sweden by ..... 70
Skates, Roller, Rider's Weight Propels..... 592
Skeleton, Chief's, Unearthed in Mound Builder's Tomb ..... 688
Skeleton of Giant Whale on Truck..... 581
Ski Jumping in Summer Expert's Sport..... 641
Skidding Machine, Steam, Erected by Americans in France..... 108
Skin of Hand, Razors Stropped on..... 773
Skunk, Live Bait Trap for..... 792
Slab of Wood, Inkwell and Letter Opener Made from ..... 475
Slack Coal, Water Covers in Part, by G. F. Paul ..... 887
Slag, Cement Containing Gypsum Made from 77
Slate Waste of North Wales, Many Uses for 668
Sled, Alaskan, Bicycle Power Wheel Motorizes ..... 878
Sled, Dog, Alaskan Mounts Wheels on..... 569
Sled, Power, Made from Motorcycle..... 947
Sleds and Ice Boats, Air Propelled..... 788
Sleeve, Tin, Piston Rings Fitted with..... 456
Slicer for Vegetables..... 473
Slides of Rock, Wing Fences Protect Power House from ..... 418
Slip Jack Cart, High Wheeled, Heavy Loads Carried by ..... 330
Smelters, Electric, Planned for Dutch East Indies ..... 744
Smoke Barrage in Mimic War, Public Thrilled by ..... 84
Smoke, Candle, Imitation Marble Finish Produced by ..... 314
Smoke Law Violations, Telescopes Reveal... 853
Snails in Glass Tumbler, Texan Photographs 172
Snake, China Egg in Henhouse Traps..... 406
Snakes—Ranchmen Hunt Rattlers with Cavalry Sabers ..... 591
Snap Button of Glove, Repairing..... 145
Snap Fasteners, Hose Paired by Means of... 635
Sniper, Tricks of, by Rex Harrow..... 737
Snow and Ice Automobile, Egg Shaped Runners for ..... 1
Snow Fence, Drifts Prevented by..... 924
Snow, Melting, Snowslides in Alaska Sluiced by Streams from..... 433
Snow Shoes, Tin Can Used to Make ..... 959
Snow Shovel, Fulcrum Attachment for..... 957
Snowballs, Wind in Maine Forms..... 694
Snowplow, Street Gutter, Drainage Kept Open by ..... 174
Snowslides, Curving Corrugations on Sheet Metal Roof Plates Prevent..... 279
Snowslides in Alaska, Streams from Melting Snow Used to Sluice..... 433
Snuffer, Falling Lamp Flame is Extinguished by ..... 438
Soap, Abrasive, Slate Waste of North Wales to be Made into..... 668
Soap and Lard, Summer Ski Slide Greased with ..... 641
Soap Bar in Window Display, Foch Carved in 56
Soap, City Softens Water to Save..... 816
Socket, Bolts Held from Turning by..... 139
Socket Wrench, Ratcheted, for Tight Corners ..... 251
Socket Wrench, Universal Joint for..... 608
Soda and Sawdust, Fires Extinguished with. 770
Soda Fountain, Automobile Filling Station Equipped with ..... 590
Sodium as Conductor of Electricity, Germans Considered ..... 191
Sodium Bearing Mineral, Water Softened with ..... 407
Sofa, Phonograph under Arm of..... 754
Solar Heat, Steam Engine Run by..... 795
Solder, Basin of Water Salvages..... 777
Solder for Tin Roof, Rosin from Knots in Pine Boards Used for..... 295
Solder for Use with Aluminum, Switzerland Produces ..... 368
Solder, Pearl Handle of Knife Repaired with 310
Soldering Copper, Holes in Convey Solder to Point of ..... 767
Soldering Copper, Nickel Pointed, for Aluminum Work..... 299
Soldering Copper Works like Fountain Pen. 767
Soldering Coppers for Wiring, Handy Forms of ..... 459
Soldering Iron Stove, Swinging Support for. 771
Soldering Paste, Dipper for..... 612
Soldier, American, French Consul Decorates in Cincinnati Street..... 17
Soldier, American, Spirit of Exposition Shown in Statue of..... 210
Soldier, American, Swimming Race at Paris Won by ..... 349
Soldier, Blind and Armless, Typewriter Operated by ..... 703
Soldier—Cavalryman, Loss of Legs does Not Prevent Riding of..... 118
Soldier, Dead, County Bridge Dedicated to. 193
Soldier Inventors, Pay Due to..... 536
Soldier, Letter Eight Months on Way Received by ..... 664
Soldier Memorial, Chicago Plans Stadium to Be ..... 273
Soldier, One Armed, Moving Picture Machine Operated by..... 40
Soldier, Plunge over Chalk Cliff in France Survived by ..... 347
Soldiers, American, Newspaper Published in Russia by ..... 740
Soldiers, American, Pontoon Bridge Built across Rhine by..... 716
Soldiers, American, Study in German School. 749
Soldiers, American, "Victory" Medals for... 116
Soldiers and Sailors, Farm Training for..... 555
Soldiers, Dead, France Adopts Diplomas for Honoring ..... 720
Soldiers Dead in France, Permission Refused to Return..... 916
Soldiers, Electric Sign on Wisconsin Capitol Dome Welcomes ..... 751
Soldiers, Former, Vocational Training Books for ..... 752
Soldiers, Government Hospitals Stage Dressing Contests for..... 527
Soldier's Helmet, Lighting Fixture Made of. 828
Soldier's Helmet, Statue of Liberty Wears.. 872
Soldiers' Honor Roll on City Street..... 396
Soldiers, Improvised Wire Twister Built by.. 68
Soldiers in Russia, Toboggan Slide Made by. 862
Soldiers, Monument in Training Camp Erected by ..... 700
Soldiers, Permanent Memorial Arch for..... 828
Soldiers, Returned, March through Victory Arch ..... 750
Soldiers' Sanitary Station, "Cooties" Killed by Steam from Locomotive in..... 386
Soles, Shoe, Varnish Used to Preserve..... 791
Somersaults, Back, Swimmer Tries in Surf.. 467
Soot in Chimney, Gun Discharge Dislodges.. 462
Sound, Instrument for Measuring..... 855
Sound Vibrations, Electric Machines Controlled by ..... 863
Sounding Board for Electric Bell, Cigar Box Used to Make..... 792

Sounding Board, Glass, Church Auditorium Fitted with ..... 558
Sounding of Ocean by Explosives..... 726
Souvenir of War, Corporal Secures Generals' Signatures for ..... 367
Spade Prevented from Cutting Shoe..... 620
Spanker, Electric ..... 921
Spark Arresters on Locomotives, Fire Claims Reduced by ..... 44
Spark Plug, Carbon Kept Away by Loose Balls in ..... 49
Spark Plug Tester, Plug in Pressure Chamber of ..... 885
Spark Plug Wires, String Used to Identify.. 778
Spark Plugs on Auto, Trough for Rain Prevents Grounding of..... 293
Spectacles, Aged French Refugees Receive.. 539
Spindle, Drill, and Motor on Arm of Radial Drill ..... 680
Spindles on Shaper, Electric Motor Drives.. 423
"Spirit" Table Lifter..... 796
Sponge and Soap Holder for Bathroom..... 914
Sponge Mitten and Wringer, Scrubbing Made Easier by Use of..... 155
Spools, Film, Window Sign Holders Made from ..... 147
Spools, Old, Shelf Cabinet Made of..... 630
Spoon for Lemonade, Ferrules for Straw on Handle ..... 434
Spoons, Glass, Hollow Handles Serve as Straws on ..... 594
Sportsmen, One Legged, Play Continued by. 200
Sportsmen, Railroad Runs Trailer Car for.. 416
Sportsmen's Hotel Floats on Lake..... 835
Sports, Concrete Poured Into Walls through 240
Spouts, Flexible Steel, for Oilcans and Grease Guns ..... 749
Sprayer for Use on Throat, Anti-Influenza... 915
Sprayer, Gasoline, Metal Parts Cleaned with 940
Sprayer, Plant, Advertising Signs Made with 770
Sprayer, Traveling, Tree Pests Eradicated by 566
Sprayer, Two Tip, Streets Oiled Quickly with ..... 404
Sprayers, Whirling, for Fruit Orchards.... 356
Spreader for Beads of Auto Tires..... 64
Spring Board for Swimming Pool..... 466
Spring Coupling, Coil, for Sewing Machine Belts ..... 138
Spring Mountings, Diamonds Displayed on.. 155
Spring of Auto, Tool Made from..... 610
Spring Water, Camp Refrigerator Uses..... 466
Springs, Auto, Truck Bumpers Made of..... 142
Springs, Chute Hooks Supported by..... 941
Sprinkler, Auto, Tank Carried on Trailer of 566
Sprinkler, Circular, for Vegetables..... 451
Sprinkler, Lawn, Drum of Hose Reel Forms. 114
Sprinkler, Lawn Sprayed in Half Circles by. 256
Sprinkler, Lawn, Turtle Acts as..... 800
Sprinkler Wagons Wash Streets with Sheep Dip ..... 433
Sprinklers, Street, Water Hauled to Houses by ..... 893
Sprocket, Idle, Drive Chain Kept from Flapping by ..... 127
Sprouts, Rustic Table Leg Grows..... 101
Spruce and Balsam Pillow for Typewriter Muffler ..... 151
Spur for Walking on Ice..... 926
Spur Grass, Machine with Adjustable Hob Spindle Cuts ..... 426
Square, Bevel Protractor on..... 797
Square, Combination, Tool Forms..... 152
Square, Folding Rule Forms..... 137
Square Hole, Round Bit Bores..... 796
Squares, Carpenters', Distances Measured by ..... 132
Squash, Shellac Coat Preserves..... 610
Squeegee Machine, Water on Floor Collected by ..... 682
Squirrels, Ground, Auto Exhaust Kills..... 614
Stadium, Huge, Chicago's Soldier Memorial Planned to Be..... 273
Staircase, Toy, Figures Descend..... 921
Stairs, Painting ..... 452
Stairway, Disappearing, for Attic..... 940
Stairway, Ocean Beach Reached by..... 37
Stakes, Surveyors', Distribution of..... 764
Stall, Back Yard, Milk Goat Kept in..... 255
Stall for Shower Bath, Bathroom Fitted with 405
Stammerer, Cerebral Congestion Causes Troubles of ..... 256
Stamp By-Products, Government Use Found for ..... 875
Stamp Moistener, Aluminum, Perforated Cap on ..... 835
Stamp, Rubber, Is Adjustable..... 145
Stampings, Sheet Steel, Gasoline Engine Made of ..... 439
Stamps, Steel, Homemade Mounting for.... 450
Stand for Tobacco Pipe, Wire Used to Make. 793
Stand, Peanut, Automobile Disguised by.... 738
Stand, Shoe Polishing ..... 522
Stands for Tape and Drills, Shop Work Made Easier by Using..... 433
"Star-Spangled Banner," Pictures Used to Teach ..... 209
Starch Plant Explosion, Death and Ruin Wrought by ..... 201
Starters, Electric, Naval Seaplanes Supplied with ..... 245
State, Illinois, Memorial Building to Commemorate Statehood ..... 649
State Seals, Hardware Stock Reproduces.... 695
Stations, Battery Charging, Electric Autos Charged at ..... 40
Stations, Repair Equipment, Electric Railroad Adopts ..... 229
Statistics, Report of "No Accident Week" Gives ..... 569
Statistics, War—Buildings in Devastated Districts of France, Minister Reports Condition of ..... 230
Statue of American Soldier, Exposition Spirit Shown in ..... 210
Statue of Liberty, Soldier's Helmet Worn by 872
Statue of Lincoln for City of Manchester.. 811
Statue of Uncle Sam, Visiting Fleet Welcomed by ..... 688
Staves, Wooden, Huge Water Pipe Made of. 437
Steam and Gasoline Driven Engine..... 254
Steam, Automobile Radiator Cap Condenses 728
Steam Bath, Iron Made Proof against Rust with ..... 118
Steam Cider Evaporator, Apple Jelly Made with ..... 363
Steam Cookers, Copper Diaphragms Make Safe ..... 583
Steam Cookers in Field..... 860
Steam Forge Hammer, Largest in U. S.... 270
Steam from Locomotive, "Cooties" Killed with ..... 386
Steam Jet, Automobile Parts Cleaned with. 898
Steam Road Roller, Soil Sterilized with.... 705
Steam Roller, Steel Cylinder Protects Hose on ..... 69
Steam Shovels, Bunkers Used by Excavating Contractors to Keep Busy..... 735
Steam Turbine, Largest, New York Installs 242
Steamer, Explosion of Concrete Elevator Wrecks ..... 664
Steamer, Stranded, Empty Barrels Used to Float ..... 330
Steamers, Tank, American Shipyards Build Five during July..... 734
Steamship "Anoka," Auxiliary Condenser Used to Cool Oil on..... 739
Steamship "Mylie," Chinese Build..... 399
Steamship Service between Rio de Janeiro and San Francisco ..... 6
Steamship "Western Knight," Disastrous Maiden Voyage of ..... 551
Steamship "Yomei Maru," Shipyard Makes Record Repairs on ..... 374
Steamships Sail from Mobile, Ala., to European Ports ..... 738
Steel and Concrete Park Bench, Immovable 756
Steel and Wood, Boat Hull Combines Use of 904
Steel Brush, Rifle Cleaned by Shooting..... 598
Steel, Casehardened, Method of Straightening ..... 460
Steel Cylinder, Hose on Steam Roller Protected by ..... 69
Steel Flagpole, Bent, Cut Off and Spliced.. 270
Steel Freight Containers for Boats and Cars 574
Steel Gauze, Lead Reinforced with..... 602
Steel, Gun, Electric Furnace Shortens Making of ..... 224
Steel, High Speed, Saving ..... 609
Steel, High Speed Scrap, Reclaiming..... 100
Steel, High Speed, Tools of..... 715
Steel Impurities, New Etching Process Reveals ..... 190
Steel, Knife Sharpening, File Used to Make 798
Steel, Nitric Acid and Water Used to Color. 615
"Steel" (Poem), by Lydia M. D. O'Neil..... 282

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Steel Shell Cases, Germany Makes into Pig Iron ..... 181
Steel, Signal Tower, Storm Warnings Given by ..... 893
Steel Stamp Mounting, Homemade..... 450
Steel Tanks for Liquids, Made in Sections.. 602
Steel Tubing, Removing Scale from..... 937
Steel Vacuum Bottle ..... 755
Steel with Sharp Corners, Hardening..... 766
Steel, Wood That Is Stronger Than, by E. T. Bronsdon ..... 419
Steeple Jack Climbs Giant Mast to Repair Wireless ..... 400
Steering Wheel, Top of Cut Off ..... 619
Step, Automobile Carries ..... 157
Stepladder and Ironing Board, Convertible Chair Used as ..... 434
Stepladder and Stilts, Walking Ladder Combines ..... 458
Stepladder, Kitchen Stool Combined with.. 275
Stepladder, Wheeled, Crank Operates..... 364
Stevedores, Chain Conveyor Removes Danger to ..... 65
Sterilizer, Toothbrush, Fruit Jar Used to Make ..... 474
Stiles, Old Fashioned, Ocean Beach Reached by Using ..... 37
Stills, Continuously Acting, Foreign Tar Makers Use ..... 45
Stilts and Stepladder, Walking Ladder Combines ..... 458
Stilts, French Sheepmen Use..... 875
Stings of Bees, Formic Acid Obtained from, by Sam E. Conner ..... 355
Stockings, Snap Fasteners Used to Pair... 635
Stoker, Mechanical, Coal Fed to Locomotive by ..... 398
Stone, Crushed, Unloader for..... 763
Stone Cutter, Modern, Granite Sliced like Cheese with ..... 412
Stone, Circular, Made from Oilstone..... [illegible]
Stool, Kitchen, Stepladder Combined with.. 275
Stopcock for Liquids, By-Pass for Gas on.. 437
Storage Battery Cells, Float Indicates Level of ..... 136
Storage Battery Locomotive for Mines..... 6
Storage Battery Locomotive, Train Pulled by ..... 906
Storax, Substitute for Produced by Domestic Red Gum Tree ..... 746
Store Alarm Clock ..... 310
Store, Circulating, Groceries Taken to Customers by ..... 260
Store, Coöperative, in University..... 424
Store, Department, on Ship for British Navy 92
Store, Drug, Sells Everything but Drugs... 730
Store, Los Angeles, Odd Features in Basement of ..... 823
Store, Retail, Machinery Serves Shoppers in 855
Store, Silo in Railroad Yard Used as..... 850
Store, Small, Moves to State Street, by E. T. Bronsdon ..... 173
Storks Again Build Nests in Strassburg..... 93
Storm, Cyclonic, Minnesota Town Visited by 546
Storm Warnings, Steel Signal Tower to Give ..... 893
Storms, Cyclonic, Studied on Surface of Sun 86
Storms, West Indian, Meteorological Station in Florida to Detect ..... 44
Stove, Dutch Oven, Directions for Making.. 786
Stove for Camp, Folding..... [illegible]
Stove, Muffler, on Motorboat..... 630
Stove, Soldering Iron, Swinging Support for 771
Stovepipe, Can Opener Used to Cut..... 785
Stovepipe, Crane for Lifting Wagon Bed Rotates in..... 780
Strainer, Measure, and Funnel, Combination Flexible Nozzle Oilcan Is..... 439
Strainer, Semicircular, for Cooking Vessel Top ..... 595
Strap, Adjustable Bootjack Made of..... 276
Strap Hinge, Automobile Lock Made of..... 286
Strap Hinge Used as Hasp..... [illegible]
Strap Iron, Hammer Made of..... 156
Straw, Paraffined Paper, in Iced Tea Spoon 434
Straw, Poultry House Walls Reinforced with ..... 605
Straw, Wet, Making Barrels Water-Tight with ..... 145
Strawberry Beds, Runner Cutter Used to Weed ..... 125
Straws, Soda Fountain, Dipped in Paraffin Insulators for Low Voltage Wires..... 307
Stream, Mountain, Measuring Flow of..... 282
Street Car Dives into Pit Unharmed..... 225
Street Car Flooring, Fence Built with..... 110
Street Car, Private House Entered by..... 84
Street Car Rides, Length Varies Cost of... 913
Street Car Rides, Unlimited, for One Dollar 520
Street Cars, Automatic Window Screens for 219
Street Lamps, Experimental, on City Boulevards ..... 873
Street Lights, Wagons and Equipment for Cleaning ..... 910
Street Pavement, Asphalt, Cobblestones Used as Base for..... 913
Street Railways, Metal Carfare Tokens Used on ..... 917
Street Roller, Mixer for Asphalt or Concrete Attached to ..... 202
Street Safety Zones, Raised Platforms on.. 910
Street Service Station, Aeroplane "Gassed" at ..... 842
Streets, Sprinkler Wagons Use Sheep Dip to Wash ..... 433
Streets, Two Tip Oiling Sprayer for..... 404
Streets, Wooden, Automobiles Wear..... 760
Stretcher Cases, Hospital, Incline as Means of Ingress for ..... 96
Stretcher, Adjustable, Hinged Bottom in Ambulance Airplane Holds..... 223
Stretchers, Motorcycles Equipped with..... 56
String and Metal Strips, Paper Clips Made of ..... 299
String Kept on Old Handle..... 300
Strings, Automobile Spark Plug Wires Identified by ..... 778
Strop, Razor, Newspaper Serves as..... 795
Strop, Skin of Palm Is for Razor..... 773
Students at Harvard, Outdoor Games Compulsory for ..... 698
Students, Tractor Cultivator Built by..... 280
Stump Drills, Portable, Generating Plant Drives ..... 52
Stump, Garden Seat Mounted on..... 465
Stumps, Land Clearing Method Saves..... 880
Stumps, Tree, Smokeless Powder from Is War Development, by E. T. Bronsdon... 549
Submarine Accident, Extraordinary, by John Edwin Hogg ..... 322
Submarine, American, Sinking of..... 744
Submarine, America's Largest, Speed Record Broken by ..... 672
Submarine Cable Planned for Pacific Ocean 540
Submarine Chaser Race, Record Broken in. 745
Submarine, Chilean, Sinks ..... 210
Submarine, German, U. S. Conducts Recruiting Campaign with..... 341
Submarine Motors, Trained Sea Lions Follow Sounds of ..... 2
Submarine, Panama Loan Subscription Carried in ..... 237
Submarine, Salvaging, Ocean Bed Explored by ..... 482
Submarines, American Shipyards Build.... 734
Submarines and Seaplanes, Radio Experiments Indicate Coöperation between..... 648
Submarines, Dry Dock with Huge Tank Used by Germans to Test..... 184
Submarines, German, Metal Fish Track..... 906
Submarines, Oil Burning, may Alter British Navy ..... 828
Subway for Live Stock, Cattle Killing by Trains Stopped by ..... 186
Subway Hangar, Ring Shaped, for Airships. 106
Subway Line in Madrid to be Opened, by G. E. Paul ..... 596
Subway Ventilators, Angle for Lost Articles in ..... 422
Suction Cups, Rubber on Back of Nail Brush for One Armed Persons..... 275
Sugar and Alcohol Producers, New Process Aids ..... 848
Sugar Beet By-Products, Beef Cattle Fattened on ..... 413
Sugar, Beet, U. S. Second among Producers of ..... 896
Sugar Cane, Japanese, "Mosaic" Disease does Not Affect ..... 254
Suitcase, Aluminum Ironing Board for..... 274
Suitcase Dark Room, Photography Aided by 287
Suitcase, Handle in End of..... 299
Sulphuric Acid, Leaking Radiators Repaired with ..... 477
Summer House, Rustic ..... 639
Sun, Astronomers Observing Gas Cloud on 200


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Sun, Steam Engine Run by..... 795
Sun, Tornadoes on Surface of Studied..... 88
Sundial, Primitive, Mexican Indian Uses.... 552
Sunrise, Ring, by Latimer J. Wilson..... 757
Sun's Heat, Varying, Weather Forecast by. 102
Sunshade for Rifle Sight..... 306
Supercharger, Engine, Record Flight Made Possible by ..... 519
Supercharger of Aeroplane Engine, Altitude Mark Set by ..... 898
Surgery—Artificial Joint, Spanish Surgeon Invents ..... 383
Surgery—Blood Transfusion Operations, Persons Examined for..... 162
Surgery—Dissection Work, Aerial Searchlight Projects ..... 745
Surgery—New York Diagnostic Clinic, by W. F. Goodwin ..... 865
Surgery—Solid Paraffin Employed in Facial Operations ..... 508
Surgery—Twins, Filipino, Operation to Separate ..... 761
Surgeon, Anatomical Films Prepared by... 544
Surgeon, Electric Bell Used by in Hospital. 784
Surgeon, Spanish, Artificial Joint Invented by ..... 383
Survey, Aeroplane, Wood Pulp of Forests Valued by ..... 340
Survey of Amazon River, Commercial, Brazilians Make ..... 864
Survey Parties, African Air Route Traced by ..... 398
Surveyors' Stakes, Distribution of..... 764
Suspender for Tools, Shipbuilders Test.... 824
Swamp Lands, Florida, Drainage Project to Reclaim ..... 172
Swamps, Concrete Aqueduct Builders Impeded by ..... 559
Swamps, Southern, Lizards for Greenhouses Furnished by ..... 724
Swimmer, Back Somersaults in Surf by.... 467
Swimming Pool Cleaner, Sediment Removed with ..... 574
Swimming Pool, Spring Board for..... 466
Swimming Race at Paris, American Soldier Wins ..... 349
Swimming Suit, Inflatable, Wearer Not Hampered by ..... 710
Swing, Hand Car ..... 308
Swing, Pressure on Stirrups Sets Pony in Motion on ..... 441
Switch for Battery Circuits, Screen Door Hook Forms ..... 288
Switch, Motor Starting, Man Protected by.. 69
Switch, Reversing, Push Button Operates... 138
Switch, Series Parallel, for House Lights.. 292
Switch, Simple, for Experimenters..... 156
Switches, Small Semaphores Protect Electric Railroad Cars at..... 739

Table and Benches, Combination, for Child's Room ..... 920
Table and Benches, Concrete, Picnickers Find in Western Cañon ..... 911
Table and Chair, Child's..... 952
Table and Shelf, Combination..... 637
Table, Convertible, Has Three Different Uses ..... 765
Table, Desk for Calculating Machine Made from ..... 300
Table Extension, Simple ..... 957
Table, Kitchen, Dishwasher When Closed Is 115
Table Lamp, Electric Phonograph Combined with ..... 275
Table Lamp, Steering Wheel Used to Make. 785
Table Leg, Crippled, Repair of..... 288
Table Leg, Rustic, Sprouts Grow on..... 101
Table, Library, and Writing Desk Combined 755
Table Lifter, "Spirit" ..... 796
Table, Nursery, Blackboard in Tray of..... 920
Table, Open Drawer Supports ..... 297
Table, Outdoor, Two Hundred Eat Breakfast at ..... 505
Table Relish, Pickled Seaweed as..... 268
Tack, Thumb, and Lifter, Draftsmen Aided by ..... 557
Table Top Arranged for Reduction in Size. 754
Tabulator on Billing Machine or Typewriter, Adjusting ..... 951
Tackle Blocks, Heavy Countershaft Used to Raise ..... 133
Tacks, Magnet in Broom Handle Picks Up. 155
Tailor, Sailors Swim While Clothes are Pressed by ..... 241
Tailor's Iron, Boy with Broken Arm Uses to Explode Torpedoes ..... 761
Tailors, Men's, Seek to Revive Stocks and Knee Breeches ..... 918
Tailstock Wrenches, Loss of Prevented..... 284
Talcum Powder, Playing Cards Cleaned with 950
Talking Machines, Sofa Arm Conceals..... 754
Talking Machines, Presidential Campaign of 1920 to Use ..... 497
Tank, Army, Used to Wreck Concrete Wall 525
Tank, Concrete, Protecting Edges of..... 442
Tank, Concrete Water, Attractive Tower Conceals ..... 901
Tank, Electroplating, for Small Parts..... 448
Tank, Fighting, Toy for Boy Is..... 463
Tank for Oil, Concrete, Is Leak-Proof..... 230
Tank, Gasoline, Soap Plugs Stop Leak in.... 962
Tank, Gasoline, Spare Tires Carried on..... 736
Tank, Huge, on Dry Dock, Submarines Tested by Germans in..... 184
Tank of Cheesecloth, German Camouflage Builds ..... 367
Tank, Oil, Fire from Lightning Destroys... 704
Tank Ship, Largest, Oil Handled Rapidly by 404
Tank, Siphon, Starting Flow of Gasoline with ..... 452
Tank Steamers, American Shipyards Build Five during July ..... 734
Tank, Trailer on Street Sprinkler Carries.. 566
Tank Trucks, Aeroplanes Supplied with Gasoline by ..... 231
Tank, Water, Locomotive Crane Lifts..... 348
Tank, Wheeled, for Floor Mopping..... 705
Tank, Wooden Battleship Made into..... 440
Tanks, Europeans Climb Mountains in..... 830
Tanks for Liquids, Made in Sections..... 602
Tanks, Gas, Barge Rafts Carry Upstream.. 70
Tanks, Old, Water Plug on Corner Protected by ..... 456
Tanks, Powerful, American Arsenal Builds. 827
Tap and Drill Stands, Shop Work Made Easier by ..... 433
Tap, Method of Enlarging Hole Made by.. 314
Tap, Nipple, for Wire Automobile Wheel... 796
Tap, Right-Hand, Left-Hand Thread Made on Bolt with ..... 773
Tap Wrench, Turnbuckle Used as..... 476
Tape Measure, Pocketknife Conceals..... 275
Tapeline, Plumb Bob Hung on..... 456
Tapers on Christmas Tree, Metal Candlesticks Replace ..... 598
Tar Makers, Foreign, Continuous Distillation Employed by ..... 45
Target, Air Rifle, Shot Saved by..... 633
Target Practice—Sunshade for Rifle Sight. 305
Targets and Junk, Warships Used as..... 587
Targets, Electric Light Globes as..... 477
Tax, Export, International Lumber Mill Escapes Payment of ..... 869
Taxicab, Motorcycle Sidecar, Passengers Carried in ..... 255
Taxidermist, Antlers Piled High on Shop Roof of ..... 96
Tea Wagon and Dishwashing Machine Combined ..... 277
Teak, Danish Hardening Process Makes Ash Substitute for ..... 579
Teeth, Inserted, on Circular Saw..... 424
Teeth, Mississippi River Taught to Brush Its Own, by H. H. Dunn..... 8
Telegraph and Telephone Men, U. S. Signal Corps Needs ..... 668
Telegraph and Telephone, Seaplane and Submarine Communicate by..... 648
Telegraph Clerk, Watch Case Receiver in Head Set of ..... 606
Telegraph Dots and Dashes, Office Help Located by ..... 485
Telegraph Line Repair Men in Canal Zone, Seaplane Carries ..... 560
Telegraph Pole Tops, Signs Warning Airmen on ..... 260
Telegraphic Machine, Telephone Calls Recorded by ..... 181
Telescopes, Smoke Law Violations Revealed by ..... 853
Temperature Variations, Pyrometer Flashes Signals of ..... 391
Temperatures, Distant, Electric Thermometer Reads ..... 746

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Telephone and Telegraph Men, U. S. Signal Corps Needs ..... 668
Telephone and Telegraph Messages Sent Simultaneously on a Single Wire..... 14
Telephone and Telegraph, Seaplane and Submarine Communicate by..... 648
Telephone, Automatic, Exchanges in Copenhagen, American Equipment for..... 657
Telephone Calls, Telegraphic Device Records ..... 181
Telephone Circuits, Crystals Replace Batteries in ..... 184
Telephone Girl, Office Help Located with Dot and Dash Call Used by..... 485
Telephone, Lighthouse Linked with Mainland by ..... 841
Telephone Lines, Long Distance, India Now Has ..... 674
Telephone-Megaphone, Trapshooting Referee Uses ..... 29
Telephone Receiver, Alternating Current Detected by ..... 316
Telephone Receiver Connector, Multiple.... 951
Telephone Stand, Seat Folds Up on..... 114
Telephone Transmitter, Outside Sound Inaudible with ..... 4
Telephone, Wireless, Outfit Plugs into Lamp Socket ..... 666
Telephones Scarce in Japan, People Wait for Installations ..... 164
Temple, Underground, Museum Entrance Is 532
Tenements, Model, London Slums to be Replaced by ..... 58
Tennis Players, Signboard Appeals to..... 740
Tent, Canvas, Laboratory Tents for Proofing Process of..... 593
Tent Covers, Wells in Kansas Equipped with ..... 898
Tent for Summer Campers, Grass and Pine Needles Used to Make..... 315
Tent Manufacturer, Blind Taught Rope Work by ..... 585
Tent, Seven Room, Motorist's Home in..... 269
Tents, Shingled Roofs for ..... 596
Terminal, Transatlantic, Hog Island to Be.. 800
Terracing Machine, Steel, Soil Erosion Prevented by ..... 57
Test Cylinders, Concrete, Paper Molds Used to Make ..... 896
Test Clips, Insulated ..... 938
Test for Manila Rope..... 927
Test Gauge for Lathe Centers..... 292
Test of Gas Mask, War Veteran Asphyxiated in ..... 912
Test of Waterproof Leather, Scientific Methods Used in ..... 598
Test, Service, Railroad Gun Carriage in.... 511
Test, Water in River Seine Subjected to... 909
Testing Drill, Samples Cut from Pavement with ..... 872
Tests, Chemical, Dangerous Ocean Currents Spotted by ..... 266
Tests, Government, of Fabrics Prove Dependable ..... 352
Tests, Laboratory, of Mildew Proofing Process ..... 593
Tests, Laboratory, Value of Imported Oils Determined by ..... 868
Tests of Ammunition, Many Cartridges Required for ..... 586
Tests of Imported Food, Argentina Makes. 876
Textile Industry, American-Made Dyes for. 878
Theater, Bolshevists' Pay Roll Plan Fails in 413
Theater Crowd, Entrance Floor Collapses with ..... 666
Theater, Danish, Huge Concrete Dome Crowns ..... 897
Theater, Glass Walled, on Building Roof.. 522
Theater Nursery, Show House Provides..... 60
Theater Orchestra "Gun," Foot Pressure Shoots ..... 249
Theater, Toy, Magnet Moves Figures in..... 921
Theater Ventilation, City Freight Tunnel Tapped for ..... 396
Theatergoer's Hat or Bag, Folding Hook Holds ..... 116
Thermometer, Electric, Distant Temperatures Read by ..... 746
Thermometers, Fever, Restoring Graduations on ..... 454
Thermometers, Tree Crickets as..... 474
Thermostatic Valve, Water Vapor Fed to Auto Motor by ..... 244
Thermotherapy—Portable Therapeutic Oven 414
Thieves, Thumb Prints Protect Auto from.. 516
Thimble, Acetylene Welder Wears..... 453
Thirst Allayed by Cigarette Tube..... 74
Thomas, H. E.:
Engineers Check Moving Mountain..... 805
Thread, Left-Hand, Made on Bolt with Right-Hand Tap ..... 773
Thresher and Harvester, Grain Delivered to Wagons by ..... 425
Thresher, Automotive, Goes from Shock to Shock ..... 553
Thresher for Broom Corn..... 94
Thresher, Rice, Tractors Belted in Tandem Drive ..... 881
Treshing Machine, Little, Boon to Farmers. 348
Throat and Nose Sprayer, Anti-Influenza.. 915
Thumb Prints, Automobiles Protected from Thieves by ..... 516
Thumb Tack and Lifter, Draftsmen Aided by ..... 557
Ties for Railroad, Special Cars Transport.. 840
Tighteners, Wire, Corner Posts of Fences Contain ..... 536
Timber Line of North, Cold Forces South.. 852
Timber on Russian Farm Lands, Large Caliber Shells Clear ..... 340
Timber Skidding Plant, Americans Erect in France ..... 108
Timber Supply, Britain's, to be Replenished. 218
Timber Tract, Projected Railroad Opens Up 13
Timber for Roofs, Test Preserving Methods for ..... 902
Timbers, Green, Ships of Emergency Fleet Ruined by ..... 64
"Timbers," Mine, Concrete Used to Make... 762
Timepiece, Pocket, Sidereal and Solar Time on ..... 256
Timepieces, Twenty-Four Hours Marked on. 888
Tin Can Chicken Feeder..... 958
Tin Can Keys, Racks Fashioned from..... 151
Tin Can, Snow Shoes Made from..... 950
Tin Cans, Hub Caps for Wagon Made of.. 607
Tin Cans, Water Wings for Swimmers Made from ..... 147
Tin Foil, China Uses Primitive Methods in Making ..... 117
Tin from Lincoln's Home, Profile Embossed on ..... 674
Tin Hat of Vikings, Lake Bottom in Sweden Yields ..... 55
Tin Roof, Resin from Pine Knots Supplies Flux for Soldering ..... 295
Tin Sleeve, Piston Rings Fitted with..... 456
Tinners' Soldering Copper, Holes in Convey Solder to Point of ..... 767
Tinner's Soldering Iron Stove, Gas, Swinging Support for..... 771
Tinsmiths' Solder, Basin of Water Salvages 777
Tire, Automobile, Form ..... 759
Tire, Automobile, Last for Garages..... 756
Tire, Automobile, Wire Used to Repair Blowout in ..... 775
Tire Boot, Pneumatic, Blowouts Prevented by ..... 829
Tire Case, Metal, for Automobile..... 510
Tire Casing, Guard for Emery Wheel Formed of ..... 288
Tire Chains, Auto, Telescopic Carrier for.. 919
Tire, Inner, Metal Armor for Auto..... 598
Tire, Paper, for Motor Truck, Metal Tread on ..... 598
Tire, Pneumatic, on Hub of Auto Wheel... 330
Tire Pressure Gauge on Air Compressor... 616
Tire Repairs, Auto, Clamp for Searchlight Aids in ..... 287
Tire Salesmanship, Traveling Experts Teach ..... 740
Tire, Solid, Record Established by..... 188
Tire, Spare Auto, Carriers for..... 706
Tire Spreader and Pressure Gauge for Auto 926
Tire Tube, Automobile, Tool Case Made from ..... 793
Tire Valve, Auto, Wire Holds Open..... 127
Tires, Auto, Hole in Rim Aids in Removal of 139
Tires, Auto, Rubber Cement Used to Mend. 157
Tires, Auto, Rubber Gaskets Made from.... 791
Tires, Auto, Tool for Spreading..... 64
Tires, Bicycle, Leather Strips Protect..... 784
Tires for Carpet Sweeper ..... 157
Tires on Doll Carriage Wheels, Worn Out, Insulated Wire Replaces ..... 315

Tires, Spare, Cylindrical Gasoline Tank Carries ..... 736
Titanium, Paint Pigments Made from..... 426
Toaster, Bread, for Use on Gas Stove..... 755
Tobacco Cans, Hinges Made from..... 633
Tobacco Pipe, Metal Cover for..... 630
Tobacco Pipe, New, How to Season..... 638
Tobacco Pipe Stand, Wire Used to Make... 793
Tobacco Pipe Stem, Tightening..... 957
Tobacco Plant, Steam Road Roller Sterilizes Soil for ..... 705
Toboggan Slide in Russia, Soldiers Make... 862
Toe Lifter, Ankle Brace, and Arch Support Combined ..... 758
Toilet Tank, Tin Can with Open End Makes Float for ..... 302
Tomato Plant Trellis, Twisted Wire Forms 153
Tomatoes, Windmill Operates Turntable for Ripening ..... 285
Tomb, Log Cabin is Trapper's..... 814
Tomb, Mound Builders' Trinkets Found in. 688
Tombstone like Medal, Boy Scout's Grave Marked by ..... 121
Tongs, Adjustable, Piston Rings Held by.. 132
Tongs, Blacksmiths', Lock for..... 774
Tongs for Hardening Round Dies..... 932
Tongs, Mason Jars Handled in Hot Water with ..... 275
Tool, Auto Spring Used to Make..... 610
Tool Case, Inner Tube Used to Make..... 793
Tool Chest, Caissonlike, Holds Many Supplies ..... 507
Tool, Deep Holes in Wood Bored by..... 300
Tool Feed for Radius Work in Lathe..... 288
Tool, Garage, Clamp for Ball Races Is..... 417
Tool, Handy, from Umbrella Rib..... 636
Tool Holder, Floating, Friction Reduced by 250
Tool Kit for Home..... 435
Tool Locker and Bench Combined..... 134
Tool Rack, Bicycle Wheel Made into..... 773
Tool, Scraping, for Metal Castings Operated by Air ..... 734
Tool Shop on Motorcycle, Power Driven Emery Wheel on..... 217
Tools—Drill for Square or Hexagonal Holes ..... 407
Tools, High Speed Steel Used to Make..... 715
Tools or Messages, Carrier in Shop for.... 288
Tools, Rust Protection for ..... 770
Tools, Steel, Removing Rust on..... 456
Toothbrush, Handle Serves as Case for..... 594
Toothbrush Rack and Sterilizer, Fruit Jar Used as ..... 474
Toothbrushes, Inverted Glass on Fixture Is Shield for ..... 594
Toothpick Holder, Salt Shaker Made into... 454
Topographical Maps, Making of Requires Hard Work ..... 731
Torch, Acetylene, Yeggmen Burn Hole in Safe with ..... 831
Torches, Drinking Cups Used as..... 306
"Torii" Gateway to Florida Estate ..... 110
Tornadoes, Solar, Electromagnetic Law Solves Riddle of ..... 86
Torpedo Boat Destroyers, American Shipyards Build 10 during July..... 734
Torpedo Boat, Halibut Trawler Made of... 376
Torpedo Harpoons, Whales Captured with.. 397
Torpedo Repairs, Special Workbench Speeds 571
Torpedo Shape for Bathing Beach Life Preservers ..... 64
Torpedo, Underground, Tunnel Dug by..... 226
Torpedoes, Toy, Boy with Broken Arm Uses Iron on Foot to Explode..... 761
Tortoise Shell, Imitation, Treated Gelatine Used to Make ..... 561
Totem, Grave of Indian Chief Guarded by. 91
Tourists, Aerial, to Journey in Squadron Formation ..... 414
Tourists, Hotel for Chauteau-Thierry to Be Mecca of ..... 78
Tourists' Tickets, Summer, Railroad Administration Sells ..... 16
Towel Hanger, Ball Clip..... 300
Towel Hangers, Garter Clasps for..... 157
Tower, Ancient, Made to Order for American ..... 77
Tower as Memorial, Pittsburgh Plans World's Highest ..... 484
Tower, Attractive, Concrete Water Tank Built In ..... 901
Tower, Eiffel, Public Now Admitted to..... 251
Tower, Fire Observation, Is High Point.. 428
Tower, Grain Elevator, Scenic Observatory in ..... 900
Tower, Signal, Storm Warnings Given by.. 893
Tower, Windmill on Vertical Axle does Not Need ..... 660
Town, Guthrie, Ia., Aeroplane Owned by... 602
Town, Negro, Virginia Builds..... 216
Towns in Peru, Isolated, Aeroplanes to Unite ..... 266
Toy Aeroplane Glider, Feathers Used to Make ..... 784
Toy Aeroplane Kite, Three Propellers on.. 760
Toy Aeroplane, Velocipede Drives..... 601
Toy Automobile, Chinese Boy Helps to Make 761
Toy—Automobile, Mechanical, on Incline... 440
Toy Balloon, Hydrogen Used to Inflate..... 465
Toy—Battleship, Wooden, Tank Made of... 440
Toy Blocks, Cement Used to Make..... 954
Toy Car, Convertible, Wheelbarrow Made of 920
Toy Doll Furniture, Steel Used to Make..... 920
Toy Factories, Japanese Children Work in. 761
Toy, Fighting Tank Is..... 463
Toy Garden, Real Plants in..... 946
Toy—Horse, Wooden, on Wheels..... 440
Toy Machine Gun, Spring Operated..... 956
Toy Machinery, Pulley for ..... 307
Toy—Monoplane Dart, Rubber Band Shoots. 440
Toy Pasteboard Fish, Oil Propels..... 796
Toy Rocker for Children..... 305
Toy Rocker, Low ..... 441
Toy Staircase, Figures Descend..... 921
Toy Theater, Magnet Moves Figures in..... 921
Toy Torpedoes, Boy with Broken Arm Uses Iron on Foot to Explode..... 761
Toy—Trotting Hobbyhorse ..... 943
Toy Water Mill, Nuts and Straws Used to Make ..... 793
Trace, Wagon, Scrap Iron Repairs..... 940
Tracing Cloth, Carbon Tetrachloride Cleans 632
Tractor Acts as Truck ..... 512
Tractor, Ballast Carried in Hollow Wheels of ..... 586
Tractor Blades, Beans Harvested with..... 62
Tractor Cultivator, Students Build..... 280
Tractor Drawn Drag, Roads Kept in Shape by ..... 251
Tractor, Endless Tread, Pikes Peak Climbed by ..... 547
Tractor, Farmer Builds Barn with Aid of.. 552
Tractor for Lawn Mower, Horse Replaced by 259
Tractor, Homemade, for Farm..... 289
Tractor Industry, Army Experts Aid..... 488
Tractor, Kerosene Burning, Novel Driving System for ..... 168
Tractor, Midget, Naval Air Station Uses to Move Aeroplanes ..... 744
Tractor Mounted "75's" Artillery Evolution Capped by ..... 204
Tractor Operated Harvesting Machines.... 365
Tractor, Railroad, Auto Chassis Becomes... 324
Tractor, Trees Sawed Down by..... 495
Tractor, Two Wheeled, Four-Horse Team Displaced by ..... 706
Tractor Wheels, Road Damage Prevented by Iron Pads on..... 701
Tractors and Trucks, Preparation of Heavy Fuel for ..... 918
Tractors, Army Officers Recommend Odd Forms of ..... 676
Tractors Belted in Tandem, Rice Thresher Driven by ..... 881
Tractors, Canada Receiving Large Shipments from U. S..... 56
Tractors, Drawbar Pull Register for..... 756
Tractors, Endless Tread, Heavy Guns Mounted on ..... 31
Tractors, Farm, Improvements in Rein Drive System for ..... 85
Tractors, Fossil Seal Bones on Prebilof Islands Hauled by ..... 70
Trade-Mark Laws, Government Registers Word under Own ..... 583
Trade Name "Anzac," Australians Ask Discontinuance of ..... 749
Traffic, Automobile, on Lincoln Highway.... 747
Traffic Record, Strange, Photographic Plate Makes ..... 216
Traffic Semaphore, Motor and Clockwork Operate ..... 880
Traffic Signal Boards, Truck Equipped with 599
Traffic, Steel Flagpole Regulates..... 588
Trail over White Mountains, Forest Service Builds ..... 652

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Trailer Bus, 80 Passengers Carried by..... 747
Trailer, Camping, Auto Body as..... 879
Trailer Car for Sportsmen, Railroad..... 416
Trailer Cart for Velocipede..... 147
Train Drive, German, Engine, Dynamo, and Motor in ..... 7
Train, Laborers', Automobile Pulls..... 748
Train, Rubber Shipment Fills..... 122
Training, Military, Boys of New York Start 829
Training Station, Naval, Electricians Trained on Dry Land Battleship at..... 829
Trains, Elevated Railroad, in Rear End Collision ..... 731
Transatlantic Flight Ends in Irish Bog.... 416
Transatlantic Flight, First, Moving Pictures Record ..... 424
Transformer Coil, Movable, Welding Set Regulated by ..... 746
Transformer, Currents of Electric Fan Regulated by ..... 342
Transformer, Doorbell Ringing, for Lamp Socket ..... 274
Transmitter, Telephone, Outside Sounds Inaudible with ..... 4
Transmitter, Wireless, Waves in Wide Beam Projected by ..... 218
Transplanting Old Fruit Trees ..... 777
Transportation—Auto Bus for Alaska Trails 371
Transportation — Merchandise, Hydraulic Tube to be Used to Transport..... 548
Trap, Catching Wild Young Cattle in..... 636
Trap, Cockroaches Caught in..... 153
Trap, Dirt, for Gasoline Line in Boat Engines ..... 295
Trap for Raccoon, Mirror Bait for..... 319
Trap, Good, How to Tell..... 944
Trap, Grasshopper, Rollers Crush Insects in 677
Trap, Lantern Attracts Moths to..... 406
Trap, Live Bait, for Small Animals..... 792
Trap, Rat, Collapsible Floor on..... 313
Trapdoor, Counterbalanced ..... 774
Trapper, Log Cabin Is Tomb of..... 814
Trappers, Wild Animal Carcasses Fed to Poultry by ..... 756
Trapshooters Telephone-Megaphone Used by Referee for ..... 29
Traveler, Chinese, Prostrates Himself along His Route ..... 544
Travelers, Glass Top Bus Aids Vision of... 80
Trawler, Halibut, Torpedo Boat Made into.. 376
Tray, Convenient, Machine Bookkeeping Speeded Up by..... 78
Tray, Currency, Desk Space Saved by Stair-like Formation of..... 195
Tray, Embroidery Hoops Used to Make..... 793
Tray for Desk, Telescoping, Fits Drawer of Any Size ..... 597
Tray for Fruit Bottles, Boiler Bottom Supports ..... 275
Tray, Padded, Eggs Collected on..... 285
Tray Rack, Electric Heated, Hospital Patients Served from ..... 107
Treaty of Versailles, Peace Medal Commemorates ..... 368
Tree, Apple, Thirty-six Fruit Varieties from 888
Tree, Baobab, Fiber of Used for Paper..... 203
Tree Base, Buttonwood, Is Well Curb..... 199
Tree, Big, House Moving Methods Used to Transplant ..... 892
Tree, Domestic, Substitute for Storax Produced by ..... 746
Tree Crickets as Thermometers..... 474
Tree, Huge, Dynamite Humbles..... 553
Tree, Palm, Transplanted as Civic Landmark ..... 224
Tree Pests, Spraying Apparatus Tours Country to Eliminate..... 565
Tree Sap, South American, as Substitute for Milk ..... 437
Tree Spray, Fertilizing Powder Used as.... 568
Tree Stumps, Smokeless Powder from Is War Development, by E. T. Bronsdon... 549
Tree Top, Aeroplane Lands in..... 569
Trees and Alfalfa, New York Roadsides to be Planted with ..... 902
Trees as Wireless Antennæ Served Army Well ..... 39
Trees, Care of Bark Wounds in..... 283
Trees, Christmas, Hauling of..... 932
Trees, Concrete Inclosures for..... 111
Trees Dedicated to Roosevelt, Boys and Girls Plant ..... 121
Trees, Dendrograph Records Changes in Trunk Sizes of..... 96
Trees, Dwarf, Growing of..... 309
Trees, Electrically Driven Portable Band Saw Fells ..... 727
Trees, Fruit, French in War Swept Territory Replanting ..... 252
Trees, Fruit, Special Rake for Cultivation of Ground around ..... 138
Trees, Fruit, Transplanting of..... 777
Trees, Giant, Enormous Wooden Derrick Made of ..... 542
Trees in Park, Engine and Compressor for Spraying ..... 701
Trees, Oak, Seven Brothers Plant as Memorial ..... 563
Trees, Old, Transplanting of..... 777
Trees, Orchard, Fertilizing Cartridge Breaks Soil for..... 282
Trees—Stump Drills, Portable Generating Plant Drives ..... 52
Trees, Tractor Saws Down..... 495
Trellis for Garden, Adjustable..... 126
Trellis for Tomato Plants, Twisted Wire Forms ..... 153
Trench Digging Machine Back-Fills as It Digs ..... 579
Trench Hose, Salvage of in England..... 717
Trestle, Unstable, Railroad Train Crosses... 522
Trestles, Shop, Legs Mounted on..... 141
Triangle for Isometric Drawing..... 926
Trick—Dot in a Circle..... 957
Trick, Egg, Self-Balancing ..... 315
Trick—Pasteboard Fish, Oil Propels..... 796
Trick—Putting an Egg in a Bottle..... 956
Trick, Rule and Hammer..... 958
Trick, Screwdriver-Compressed Air..... 629
Trick—Table Lifter, "Spirit"..... 796
Tricks, Juggler Chooses High Perch for Performing ..... 385
Tripe, Pearls Found in..... 816
Triplane, Passengers may Walk Down Fuselage of ..... 102
Tripod, Camera, Music Rack Used for..... 319
Trolley, Boat Carried to Shelter by..... 479
Trolley Dirigible System, Electric, Man Proposes ..... 239
Troop Ship "Leviathan," Berths Shown in Cross Section of ..... 238
Troops, Allied, Campaign in Russia amid Strange Surroundings ..... 230
Tropics, Diseases of, Shipboard Laboratory for Studying ..... 542
Trough on Auto, Spark Plugs Grounding ..... 953
Trough for Food Chopper..... 293
by Rain Prevented by..... 612
Trough, Watering, Heated for Cattle..... 223
Truck, Armor Plated, City Bank Delivers Money in ..... 556
Truck, Army, Repair Shop Carried on..... 571
Truck, Auto, Front and Rear Wheels Steer 356
Truck, Auto Is Hotel on Wheels..... 88
Truck Bodies, Side Dumping, for Road Building Work ..... 142
Truck Bumpers, Auto Springs Used to Make 340
Truck Chassis, Mobile House Built on..... 930
Truck, Compact, for Trunk Moving..... 590
Truck, Diagrams on Advertises Route of.. 765
Truck, Delivery, Movable Partition for..... 273
Truck Dump Body Hoist, Auto, Worm Gear Does Duty as Brake on..... 213
Truck Express, Motor, Boon to Farmers... 364
Truck, Farm, Has Appliances for Handling Fertilizer ..... 404
Truck, Fire, Aeroplane Risk Reduced by.... 540
Truck for Apartment Building Chambermaid ..... 441
Truck for Child..... 512
Truck, Industrial Tractor Acts as..... 94, 529
Truck, Motor, Engine on Trailer Hauled by ..... 833
Truck, Motor, Home Built on..... 540
Truck, Motor, Power Applied to Four Wheels of ..... 112
Truck, Motor, Special Body for..... 366
Truck, Passenger, Runs on Narrow Gauge Railroad ..... 812
Truck, Ship Welding Set Transported on.. 697
Truck Spraying Apparatus, Tree Pests Eliminated by ..... 599
Truck, Three Section Divisions for Body of.
Truck, Traffic Signal Boards Hinged under

Truck Trailer Bus, 80 Passengers Carried by 747
Truck, Vacuum Cleaner, Ashes Removed with 504
Truck Wheels, Jacks for Replacing 142
Truck with Elevator Body Loads Ice Cars. 501
Truck, Wrecking, Fire Department Equipped with 911
Trucks and Tractors, Preparation of Heavy Fuel for 918
Trucks, Army, on Western Highway, Bridges Broken by 690
Trucks, Auto, Mud Hook for 297
Trucks, Chinese Caravans Displaced by 423
Trucks, Coal, Unloader for 715
Trucks, Highway Departments of States to Receive 194
Trucks, Military, Three Mile Train of Crossing Continent 372
Trucks, Military Vibrations of Damage Paris Houses 662
Trucks, Motor, "Ship-by-Truck" Idea Promoted by Parade of 823
Trucks of Gas Company, Fire Department Aided by 546
Trucks, Road Construction, Broad Steel Tired Wheels on 246
Trucks, Tank, Aeroplanes Supplied With Gasoline by 231
Trunk Moving, Compact Truck for 930
Trunk Strap, Hole in Blown Out Casing Wound with 473
T-Square and Center Square, Tool Forms. 152
T-Square, Bevel Protractor on 797
Tube, Bent Faucet Connected into Drinking Fountain with 146
Tube, Hydraulic, Merchandise to be Transported via 548
Tube, Inner, Tool Case Made from 793
Tubercular Patients, Sanitarium Teaches Trades to 736
Tuberculosis, Aeroplane Rides Strengthen Lungs Afflicted with 580
Tuberculosis, Dye Laboratory Is Hope for Amelioration of 863
Tuberculosis—Preventoriums, Floating, by William D. Goodwin 72
Tuberculosis—Revolving Garden Shelter on Market for Fresh Air Treatment 370
Tubing, Brass or Copper, Wire Used to Splice 799
Tubing, Gasoline, Punch and Die for Flaring 141
Tubing, Steel, Soft Metal Hammer Handle Made of 937
Tubs, Divided Water Barrel Used for 450
Tug, Fire, Auto Plunges onto Deck of 884
Tugboat, Lighter Salvages 529
Tugs, Seagoing, American Shipyards Build Two during July 734
Tumbler, Inverted, Watch Tick Deadened by 935
Tungsten, Paint Pigments Prepared from 426
Tunnel, Drainage, Gold District Unwatered by, by J. E. Murphy 742
Tunnel, Electric Arc Cuts Rock in 526
Tunnel, Freight, Theater Ventilated by 396
Tunnel, Under Railroad Crossing Obviates Pedestrians' Danger 750
Tunnel, Underground Torpedo Digs 226
Tunnel, Wind, for Tests of Aeroplanes and Airships 402
Turbine Blades, Lead Coat Prevents Abrasion of 496
Turbine Engine, Tiny, Is Size of Pinhead 71
Turbine, Largest Steam, New York Installs. 242
Turbine, Nuts and Straws Used to Make 793
Turnbuckle Used as Tap Wrench 476
Turnstile, Railroad Yard Workmen Cautioned by 102
Turntable, Conveniences of Four Room Apartment Supplied by 338
Turntable for Ripening Tomatoes, Windmill Operates 285
Turret, Loopholed, Bank Guard Stands Watch in 497
Turtle, Lawn Sprinkled by 800
Twins, Filipino, Operation to Separate 761
Twist Drill, Countersinking Special Shapes with 138
Typewriter and Eraser, Inverted Drawer Holds 305
Typewriter and Wading Pool for Monkeys. 812
Typewriter Billing Machine, Adjusting Tabulator on 951
Typewriter, Blind and Armless Soldier Operates 703
Typewriter, Compressed Air Cleans 937
Typewriter, Early Model of 417
Typewriter, Long Letter to Convention Written on 430
Typewriter Muffler, Spruce and Balsam Pillow for 151
Typewriter, 100th Anniversary of Father of 80
Typewriter, Pen Used to Oil 775
Typewriter Platen, Emery Cloth Smooths 963
Typewriter, Silencing 946
Typewriter Stand and Copy Rack, Sewing Machine Used to Make 638
Typewriter, Woman with Artificial Hand Operates 520
Typhus in Poland, Drastic Orders to Prevent Spread of 598

U-Boat Motors, Sea Lions Trained to Follow Sounds of 2
U-Boat on Recruiting Campaign, Lake Cities Visited by 341
Udder, Cow's, Indians of Chile Make Basket of 261
Umbrella Rib, Handy Tool from 636
Umpire at Lawn Tennis Tournament, Chair of 681
Union, Double Eccentric, for Joining Pipes. 438
Unions, Water Pipe, Western City Uses Cement for 581
Universal Joint for Light Connection 133
University, Army, Built on Large Scale in France 53
University, Campus on Lake Shore (Chicago) 804
University Canteen, Honor System, for Students 424
University, Columbia, Spoken Chinese Taught at 341
University, Danger Sign Built by 111
University of Louvain, Belgium, Subscription to Erect Library for 844
University, Princeton, Chair of Diplomacy Planned for 836
University Students at Harvard, Outdoor Games Compulsory for 698
Unloader for Coal Trucks 715
Unloader for Road Material 763
Uranium, Paint Pigments Made from 426

Vacuum Bottle, Clamp on Motorcycle Handle Bar for 312
Vacuum Bottle, Steel Used to Make 755
Vacuum Cleaner, Swimming Pool Cleaner Operates like 574
Vacuum Cleaner Truck, Ashes Removed with 504
Vacuum Process of Dehydration Preserves Foods 247
Vacuum System, Cotton Harvesting Machine Uses 695
Valley Floor, Yosemite, Airman Lands on 682
Valley of 10,000 Smokes, Scientists Again Study 259
Valve, Automatic, Bursting Pipes Close 912
Valve Box Covers, Cast Iron Cap Seals 922
Valve, Gas Reversing, for Metal Working Furnace is Hand Operated 394
Valve Springs, Auto, Spring Washers Made of 450
Valve, Thermostatic, Water Vapor Fed to Auto Motor by 244
Valve, Tire, Wire Holds Open 127
Valve, Uniform Pressure in Balloons Maintained by 810
Valve, Whistle, Forked Stick Used to Shut Off Steam from 924
Valves, Engine, Rolling Files in Engine Tool Grind 16
Vanadium, Paint Pigments Made from 426
Vanity Case, Mesh Bag Frame Conceals 435
Vapor, Automobile Radiator Cap Condenses. 728
Vapors, Antiseptic, Infected Wounds Sprayed with 32
Vapors, Volcanic, of Alaskan Smoke Valley Explanation of 564
Varnish Brush, Cycle Chain Kept Clean with 156
Varnish, Floors Require Generous Supply of 633
Varnish, Resin from Naphthols Used to Make 404
Varnish, Shoe Soles Preserved with 791
Vase, Coconut Used to Make 956

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Vase, Earthenware, Melting Ladle Made of. 605
Vats, Iron, Are Largest Shipped by Rail.... 534
Vault, Bank, Dynamite Blasts Remove..... 244
Vault, United States Treasury, Silver Supply Too Large for..... 848
Vaults, Assay Office, in New York, Largest in World ..... 364
V-Blocks, Angle Irons Used to Make..... 312
Vegetable—Bean Found in Cliff Dwelling Sprouts ..... 74
Vegetable Slicer, Adjustable..... 473
Vegetable Sprinkler, Circular..... 451
Vegetables, Farmer Uses Novel Signboard to Advertise ..... 544
Vegetables, Fertilizing Powder Used as Spraying Solution for..... 568
Vegetables—Squash, Shellac Coat Preserves 610
Vegetables—Tomatoes, Windmill Operates Turntable for Ripening..... 285
Veneer, Gluing When Moist..... 890
Ventilation, Candle's Sensitive Flame Is Guide to ..... 696
Ventilation, Nature and Shaft Provide Mine with ..... 415
Ventilation of Poultry House..... 932
Ventilation of Theater, City Freight Tunnel Tapped for ..... 396
Ventilator Built behind Radiator ..... 925
Ventilator, Electric, Is Also Fan and Deodorizer ..... 434
Ventilators of Subway, Angle for Lost Articles in ..... 422
Vertigo after Tail Spin, Danger to Fliers in ..... 503
Vessel Visibility of, Meter Gauges..... 815
Vessels, Sailing, Motorboats Made of..... 874
Vestal, G.:
Park Possibilities Realized by Small Town 849
Veterinary Surgeon, Operating Table for Hogs Invented by ..... 584
Viaduct, Concrete, Novel Expansion Joints for ..... 877
Viaduct, Concrete, Subway for Cattle under. 186
Viaduct, Travelers Carried over Water Front Traffic by..... 77
Vibration Absorbers, Rubber Corks as .... 157
Victory Arch, Returned Soldiers March through ..... 750
Victory Loan Campaign, Chicago, Jeweled Altar of Victory Feature of..... 60
Victory Loan Subscriptions in Panama, Submarine Carries ..... 237
Victory Medal to Allied Fighting Men, France would Award ..... 599
"Victory Medals" for American Soldiers..... 116
Vignette for Photograph, How to Obtain.... 477
Vikings, "Tin Hat" Worn by, Discovered in Sweden ..... 55
Village, Eskimo, of Prehistoric Times, Scientists Unearth ..... 901
Village Grand Prè, in Nova Scotia, Disappearance of ..... 873
Villages, Javanese, Hot Mud Torrents Smother ..... 699
Vines, Doll Dress Formed by..... 785
Violin, Attachment Makes False Notes Impossible ..... 810
Violins, Remarkable, Unusual Woods Used to Make ..... 670
Vise for Planing Doors..... 934
Vocational Training Books for Ex-Soldiers. 752
Volcano, Column of Lava Spouted by..... 853
Volcano, Javanese Villages Smothered by Hot Mud Torrents from..... 699
Volcano, Vapors in Smoke Valley Issue from Fissures Caused by Eruption of... ..... 564
Volcanoes, Meteorologists Study..... 109
Votes, Bond Issue, Dog "Buster" Campaigns for ..... 588

Wading Pool and Typewriter for Monkeys.. 812
Wagon Bed, Crane Lifts Off..... 780
Wagon Home, Canvas Covered, of Sheep Herder, by Frank R. Arnold..... 189
Wagon Hub Caps, Tin Cans Used as..... 607
Wagon Loading Apparatus, Crawling, Propellers Feed ..... 212
Wagon, Tea, and Dishwashing Machine Combined ..... 277
Wagon Trace, Scrap Iron Repairs..... 940
Wagon Wheel, Greasing of without Removal 781
Wainscoting, Matting Used to Make..... 945
Walk, Board, Breakers' Force Lessened by Holes in ..... 260
Walking Stick, Jointed..... 595
Walks, Cement, Nails Hold Together..... 951
Wall, Adobe, Cemetery Gateway Outlasts... 724
Wall around Canton, Chinese Raze..... 580
Wall around Paris, Demolishing..... 870
Wall Calendar, Permanent Diary Kept on.. 436
Wall, Concrete, Tank Used to Raze..... 525
Wall Paper Borders, Tracing on Screen Cuts Out ..... 458
Walnuts, Harvesting Device for..... 902
Walnuts, Iron Pipe for Hulling..... 632
War College at Washington Renamed..... 922
War Cross, French, Consul at Cincinnati Decorates Soldier with..... 17
War Department, Camp Grant Site Bought by ..... 416
War Exhibits, Government, Use of Funds of Liberty Loans Shown by..... 95
War Medal, General Service, Great Britain to Distribute ..... 527
War Memorial, Ancient Princeton Hall Remodeled as ..... 236
War Memorial, Westminster to be Transformed into ..... 259
War, Mimic, Public Thrilled by Smoke Barrage in ..... 84
War Munitions, Surplus, Meteorologist Suggests Odd Use for..... 576
War Posters of Every Nation, Exhibit of... 202
War, Rate of Pay of Navy Increased by.... 579
War Record of Fraternity, Helmet Preserves 709
War, Smallest Machine Shop, Big Help in.. 78
War Souvenir, Corporal Obtains Generals' Signatures as ..... 367
War Tax, Sales Register Compact and Simple ..... 214
War Trophies in Smithsonian Inst., Field Kitchen of Former Kaiser Added to..... 664
War Veteran, Gas Mask Test Kills..... 912
War Work, Photographs, Colored, Used to Illustrate ..... 71
War Work, Range Finding Microphone from Hot Wire Telephone Used in..... 680
"World War," Official Designation of..... 836
Warehouse Platforms, Loading, Drawbridge across Track Connects..... 268
Warehouses, Water Front, Genoa, Italy, to Build ..... 748
Warfare, Open Mobile Pile Driver for..... 14
Warming Oven in Furnace..... 945
Warming Pad, Electric..... 638
Warrior, French, Ancient Armor Worn by.. 832
Warship, Icebergs Destroyed by..... 672
Warship, Italian, Retrieved from Sea..... 890
Warship, "New Mexico," Electric Motors Drive ..... 646
Warships, Austrian, Italians Sink..... 710
Warships, Brazilian, France to Release..... 6
Warships in Scapa Flow, German Crews Scuttle ..... 369
Warships, Targets and Junk Made of..... 587
Warships, Toy, Japanese Children Make.... 761
Wash Tubs, Divided Water Barrel Used for. 450
Washboard, Mittens Take Place of..... 635
Washer, Corrugated, on Bolt, Wood Joint Strengthened by ..... 759
Washer Cutter, Old Expansion Bit Used to Make ..... 787
Washers, Spring, Auto Valve Springs Make 450
Waste, City, Government Encourages Reclamation of ..... 497
Watch Case Receiver, Telegraph Clerk Uses. 606
Watch Dials, 24 Hours Marked on..... 888
Watch Is Emergency Protractor..... 462
Watch Pocket, Guard for..... 274
Watch Tick, Inverted Tumbler Deadens..... 935
Watch, Wrist, Hole in Gauntlet Exposes Face of ..... 784
Watch, Wrist, Silent Electric Alarm on..... 758
Water Bicycle, Submersible, for Bathers.... 30
Water Box Covers, Cast Iron Cap Seals..... 922
Water Buckets, Bamboo Logs Serve Instead of in Hawaiian Islands..... 760
Water Cooler, Canteen as..... 473
Water Fight, Fourth of July Celebrated with 48
Water for Horses, Street Sprinkler Wagons Haul ..... 893
Water for Irrigation, Fruit Growers Use Whirling Sprayer to Distribute..... 356
Water from Fire Hydrants, Riots in Mill Yard Quelled with..... 99

Digitized by Google

Water Gauge for Boilers, Perforated Metal Used to Make..... 94
Water, Hard, Sodium Bearing Mineral Used to Soften ..... 497
Water Heater, Lamp Globe Used to Make... 958
Water, Hot, Canadian Park Supplies..... 534
Water in River Seine, Test of..... 909
Water in Wells, France Undertakes Task of Purifying ..... 58
Water Meter Wheelbarrow, Theft and Waste Stopped by ..... 210
Water Mill, Ex-Kaiser Labors in Effigy beside ..... 876
Water, Mineral, at Bath, Glass Tinted by Immersing in ..... 198
Water Pipe, How to Prevent Freezing of.... 939
Water Pipe, Huge Wood Stoves Used to Make ..... 437
Water Pipe Unions, Cement, Western City Uses ..... 581
Water Pipes, Potash Used to Clean..... 924
Water Plug on Corner, Tanks Protect..... 456
Water Power Dishwashing Machine..... 928
Water Power Fan for Hot Days..... 317
Water, Rain, Grounding of Spark Plug on Auto Prevented by Trough for..... 293
Water, Reservoir Excavated by..... 560
Water Rights—Disputed Mountain Stream, Measuring Flow of..... 282
Water, Sewage, British Mills Purify and Use ..... 372
Water, Soap Saved When City Softens..... 816
Water Streams, High Pressure and Compressed Air, Sunken Logs Raised by..... 278
Water Supply System at Brest, Americans Build ..... 97
Water Tank, Concrete, Attractive Tower Conceals ..... 901
Water Tank Feed, Air Operated Control for 50
Water Tank, Railroad, Locomotive Crane Lifts ..... 348
Water—the Maker and Destroyer of Roads, by Harlan H. Edwards..... 232
Water, "Thirst Cigaret" Allays Desire for.. 74
Water Turbine Blades, Lead Coat Prevents Abrasion of ..... 496
Water, Wick Used to Supply Seedlings with 291
Water Wings, Cork Scraps Used to Make.... 159
Water Wings for Swimmers, Tin Cans Used to Make ..... 147
Waterfowl, Diet of Stray Shot Kills..... 705
Watering Trough, Heated, for Cattle..... 612
Waterproof Concrete, English Inventor Evolves ..... 71
Waterproof Paint, Rubber and Oil Used to Make ..... 730
Waterway—Canal to Connect Mississippi River and Lake Pontchartrain..... 400
Wax, Candle, Flowers Made of..... 631
Weather Bulletins, Road Conditions Included in ..... 745
Weather Conditions, Forecasting for Fliers. 898
Weather Forecast for Airmen, 30 Hour, Army Air Service Offers..... 592
Weather Forecast, Variations in Sun's Heat Studied for ..... 102
Wedges, Hammer Head Held On by..... 458
Weed Exterminating Machine, Soil Pulverized by ..... 884
Weeder, Carpet Beater Used to Make..... 473
Weeds, Sea, Insulating Material Made from. 523
Weight, Bench Drill Fed by..... 794
Weight of Air, Simple Method of Finding... 634
Weight, Trapdoor Counterbalanced with.... 774
Weld, Oxyacetylene, Huge Pump Relined by 509
Welder, Acetylene, Thimble Worn by..... 453
Welding, Building Up Worn Shaft by..... 942
Welding, Electric Metal Plates Joined by.... 378
Welding, Rotary Dredge Cutter Repaired by 418
Welding Set, Movable Transformer Coil Regulates ..... 746
Welding Set, Ship, Truck Carries..... 812
Well Curb, Base of Ancient Buttonwood Tree Used for..... 199
Well, Oil, Throttled after Six-Day Struggle. 718
Well on Dixie Highway, Farmer Builds..... 110
Wells, France Undertakes Task of Purifying Water in..... 58
Wells in Kansas, Tentlike Covers for..... 898
Whale, Arctic, Found on Pablo Beach..... 267
Whale, Giant, Truck Carries Skeleton of.... 581
Whales, Explosive Harpoons Used to Capture ..... 397
Wharf, Manila to Have Largest in World... 731
Wharves, Genoa, Italy, to Build..... 748
Wheat Crop, Bumper, Mountain States Raise 384
Wheat Direct from Harvester to Market.... 425
Wheat, Experts Write Biographies of 150 Varieties ..... 94
Wheat Head Elevator, Gasoline Engine Operates ..... 365
Wheat Substitute, Yeast Made in Breweries Is ..... 277
Wheel, Bicycle, Tool Rack Made from..... 773
Wheel, Brake, Lugs Convert into Chain Wheel ..... 618
Wheel, Doll Carriage, Wire Replaces Worn Tires on ..... 315
Wheel of Automobile, Guard for..... 782
Wheel of Buggy, Mail Boxes on..... 611
Wheel Scraper, Horizontal, Road Grading Machine Has ..... 678
Wheel, Steering, Table Lamp Made from.... 785
Wheel, Wagon, Greasing without Removing. 781
Wheelbarrow Roller, Whiskey Barrel Used to Make ..... 930
Wheelbarrow, Water Meter on Stops Waste and Theft ..... 210
Wheelbarrows, Madrid's Public Laundries Equipped with ..... 547
Wheelbarrows, Steel Rails on Runways Guide ..... 108
Wheels, Broad, on Road Construction Trucks 246
Wheels, Front and Rear, Auto Truck Drives and Steers from..... 571
Wheels, Hollow, Ballast for Tractor Carried in ..... 586
Wheels, Machine Uses Bars of Iron to Make 889
Wheels, Truck, Jacks for Replacing..... 142
Whetstone, Sandpaper Holds..... 934
Whisk Broom, Date Palm Leaves Used to Make ..... 434
Whistle, Electric, Army Bugle Replaced by. 50
Whistle, Radiator Cap, Warns of Overheated Motor ..... 728
Whistle Valve, Forked Stick Used to Shut Off Steam from..... 924
Whitewash, Chinese Prevent Theft of Coal by Sprinkling with..... 678
Whittler, Wood, Multiplex Pliers Show Skill of ..... 192
Wick, Seedlings Watered by..... 291
Wicks, Felt Hats Used to Make..... 950
Wilson, Latimer J.:
A Ring Sunrise..... 757
Wind in Maine, Snowballs Formed by..... 694
Wind, Sand Road Construction Helped by... 246
Windlass, Fisherman's Catch Drained by Turn of ..... 76
Windlass, Motorcycle Raised with..... 622
Windmill on Vertical Axle, Tower Not Required by ..... 660
Windmill, Turntable for Ripening Tomatoes Operated by ..... 285
Windmill Wheel, Wood Saw Operated by.... 508
Window Display—Embroidery Hoop Used as Frame to Display Flowers..... 152
Window Display, Foch Done in Soap for.... 56
Window Display for Carnival, 16,000 Roses Used in ..... 201
Window Display—Phonograph in Beer Keg. 325
Window Display, Spring Mounting for Diamonds in ..... 155
Wind Tunnel, Biggest Model Airplanes and Airships Tested in..... 402
Window Glass, Putty Removed from by Hydrochloric or Nitric Acid..... 773
Window, Metal Canopy Protects from Rain.. 638
Window Panes, Cushion Mounting for..... 927
Window, Play, for Child..... 945
Window Reflections, Chauffeur Locates Cars in Rear by..... 456
Window, Safety Catch for..... 456
Window Screens, Automatic, for Street Cars 219
Window Sign Holders, Film Spools Used to Make ..... 147
Window Stop, Butt Hinge as..... 937
Windows, Celluloid, Paper Clips Used to Fasten in Auto Tops..... 135
Windows, Illuminated, Crosses of Light Formed by ..... 4
Windshield, Double, Open Vision Slit Provided by ..... 864
Windshield Eye Protector for Autoists..... 712
Windshield for Motorcycle..... 59

Digitized by Google

Windshield Screen for Auto, Insects Kept Out by ..... 886
Windshields, Auxiliary, as Auto Accessories 329
Windsor, H. H.:
Adopt Metric System..... 178
After Many Days..... 35
Greatness of Small Things..... 33
Human Albatross, The ..... 36
Language of Bombs, The ..... 179
Over There and Here..... 177
Peace Terms Fair..... 35
Plane or Dirigible..... 180
Russian Experiment, The ..... 34
Stop, Look, Listen..... 817
Ten Years in the Air..... 179
Unsung Heroes ..... 177
War Taught Saving Habit..... 33
Wings, Folding, Auto Changed into Aeroplane by ..... 349
"Wings" (Poem), by Charlton Lawrence Edholm ..... 24
Winter Golf, Indoor..... 947
Winters, S. R.:
Valuable Oil from Cockleburs..... 853
Wire, Aluminum, Hair Curler Made of..... 435
Wire and Rope, Reel for..... 816
Wire, Automobile Tire Blowout Repaired with ..... 775
Wire, Bent, Broom Holder Made of..... 953
Wire Brace for Worn Broom..... 615
Wire, Brass or Copper Tubing Spliced with.. 799
Wire Brush, Potatoes Peeled with..... 462
Wire, Corners of Metal Prevented from Cracking by ..... 766
Wire Drawer Handles, Improvised..... 124
Wire, Drum for Cutting..... 124
Wire Fences, Tighteners Built in Corner Posts of ..... 536
Wire Grip, Worn, Repair of..... 787
Wire Hoe for Garden Use..... 137
Wire, Hook for Lady's Hat Made of..... 286
Wire Mesh Scratcher on Match Box..... 305
Wire Nails, Keys Made of..... 157
Wire or Cardboard, Carpet Corners Stiffened with ..... 618
Wire, Outpost, U. S. Signal Corps Used 68,000 Miles of in Month..... 13
Wire, Resistance, Electric Furnace Contains 768
Wire Sling, Green Food for Poultry Kept in. 452
Wire, Spring, Ink Bottle Holder Made of.... 618
Wire Stand, for Paper Drinking Cup..... 959
Wire, Stiff, Milk Bottle Opener Made of..... 286
Wire, Tire Valve Held Open by..... 127
Wire, Tobacco Pipe Stand Made from..... 793
Wire, Twisted, Tomato Plant Trellis Made with ..... 153
Wire Twister, Improvised, Soldiers Build under Fire ..... 68
Wireless Antennæ, Trees Used by Army as.. 39
Wireless, Automobiles to be Equipped with. 523
Wireless Communication, Lost Ship Easily Located by ..... 354
Wireless, Fire in Inflammable Goods may be Caused by ..... 222
Wireless, Lighthouse, Fog Signals Sent by. 842
Wireless Mast, Concrete, Wall of Pekin Topped with ..... 857
Wireless Messages en Route, Motor Bus Receives ..... 340
Wireless Messages, Machine Sends, by Samuel W. Beach..... 845
Wireless Music, Sailors at Sea Entertained by ..... 251
Wireless, Naval, Move to Perpetuate Public Use of ..... 558
Wireless Operation of Signal Corps, Chance to Learn ..... 668
Wireless Station, Bordeaux, France, to Have 652
Wireless Station for Communication with U. S. at Copenhagen..... 550
Wireless Station in Iceland..... 266
Wireless Station, Lyons, France, Varied Equipment in ..... 277
Wireless, Steeple Jack on Giant Mast Repairs ..... 400
Wireless Steered Aeroplane, Germans Claim to have Had..... 829
Wireless, Submarine and Seaplanes to Coöperate by Means of..... 648
Wireless Telegraph, Arctic Explorer Uses... 741
Wireless Telegraph Receiver, Messages Printed on Tape by..... 354
Wireless Telegraph Station, Largest, Buenos Aires to Have..... 872
Wireless Telephone Outfit Plugs into Lamp Socket ..... 666
Wireless Transmitter, Waves in Wide Beam Projected by ..... 218
Wires, Automobile Spark Plug, Strings Used to Identify ..... 778
Wiring Insulators from Inner Tubes..... 297
Woman Artist, Crippled, Brush Held in Teeth by ..... 554
Woman, Circus, Record Size Shoes for..... 836
Woman, Mississippi River Boat Piloted by.. 56
Woman, Old, Aeroplane Flight Taken Daily by ..... 226
Woman Typist, Handless, Simple Contrivance Used by..... 520
Women Auto Drivers, Britain Asks Uniform Skill of ..... 360
Women, Electric Cars in Albuquerque Operated by ..... 532
Women, Negro, Ship Loaded with Coal by... 577
Wood and Metal Faults, Radiographs Reveal ..... 325
Wood and Steel, Boat Hull Combines Use of 904
Wood, Cloth Dies Used to Stain..... 147
Wood, Danish Process Hardens..... 579
Wood, Dodging Freaks and Flaws in, by Brandon Tracy ..... 81
Wood Joints, Corrugated Washer on Bolt Strengthens ..... 758
Wood of Lignum Vitæ, Battleship Propeller Shaft Bearings Made of..... 662
Wood Oil Industry, Chinese, Lack of machinery Restricts Output of..... 840
Wood Pulp, Aeroplanes Survey Forests to Value ..... 340
Wood Pulp Containers, Machine Speedily Makes ..... 110
Wood Saw, Windmill Wheel Operates..... 800
Wood Slab, Inkwell and Letter Opener Made from ..... 473
Wood Staves, Huge Water Pipe Made of.... 43
Wood, Test Preserving Methods for..... 903
Wood That Is Stronger Than Steel, by E. T. Bronsdon ..... 41
Wood Turning Tool for Lathe..... 13
Wood Whittler, Multiplex Pliers Show Skill of ..... 19
Wooden Block Pavement, Rainstorm Expands and Jumbles..... 26
Woods, Soft, Process Imparts Hardwood Surface to ..... 67
Woodsman's Raft, Nails Not Used in Making
Woodwork, Rubber Band on Hammer Protects ..... 45
Woodworking Tools, File Used to Take Nicks Out of ..... 61
Wool Baling Press Works While Sheep are Sheared ..... 4
Wool, Chemical Filters of..... 63
Workbench Clamp, Auto Radiator Held by.. 69
Workbench, Special, Torpedo Repairs Speeded Up by..... 57
Workman, Falling, Human Body Forms Cushion for ..... 36
Worm Gear, Auto Truck Dump Body Held in Inclined Position by..... 27
Worms, Cranberry Destroying, Pacific Coast Growers Fight ..... 73
Wounds, Infected, Antiseptic Vapors Sprayed on ..... 9
Wreaths for World War Heroes, Civil War Monument Decorated with..... 61
Wreck, Elevated Railroad Trains in..... 73
Wreck, Railroad, Wooden Coaches Smashed in ..... 61
Wreck, Submarine, Open Hatches Cause..... 74
Wreckers, New Front Inside Old Building Revealed by ..... 13
Wrecking Truck, Fire Department Equipped with ..... 9
Wrench, Adjustable, for Hexagon Nuts..... 2
Wrench, Socket, Ratcheted Head in..... 4
Wrench, Tap, Turnbuckle Used as..... 2
Wrenches, Tailstock, Preventing Loss of.... 2
Wrestler, Head Hold Practiced on Wooden Dummy by .....
Wright, Charles H.:
Bridge Rules in Rime..... 5


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Wringer and Sponge Mitten, Scrubbing Made Easier by Use of..... 155
Wrist Watch, Hole in Gauntlet Exposes Face of ..... 784
Wrist Watch, Silent Electric Alarm on..... 758
Writing Desk and Library Table Combined. 755
Writing, Invisible, without Chemicals..... 310

X-Ray, Chemicals Analyzed by..... 816
X-Ray Machine, Dental, Tube in Cabinet of.. 657
X-Ray, Police Examine Bombs with..... 552
X-Ray, South African Diamond Mine Locates Secreted Stones with..... 39
X-Ray, Wood and Metal Defects Found by.. 325

Yacht, German, Junk Dealer Cuts Up..... 383
Yarn, Toy Electric Motor Winds..... 949
Yeast Made in Breweries Is Wheat Substitute ..... 277
Yeggmen, Hole Burned in Safe with Acetylene Torch by..... 831
Yellow Fever, Sanitation Frees World from. 802
"Yeomanette" Posts, Establishment of..... 597

Zeppelin Service to America, Germany Plans 566
Zinc, New Building Demonstrates Uses of... 39
Zirconium, Paint Pigments Made from..... 426
Zircons, White, Proposed as Diamond Substitutes ..... 523

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# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

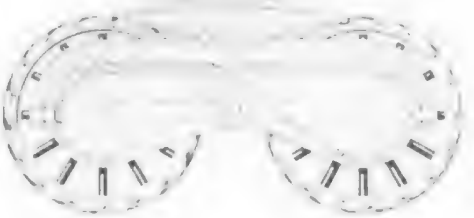
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 JULY, 1919 No. 1

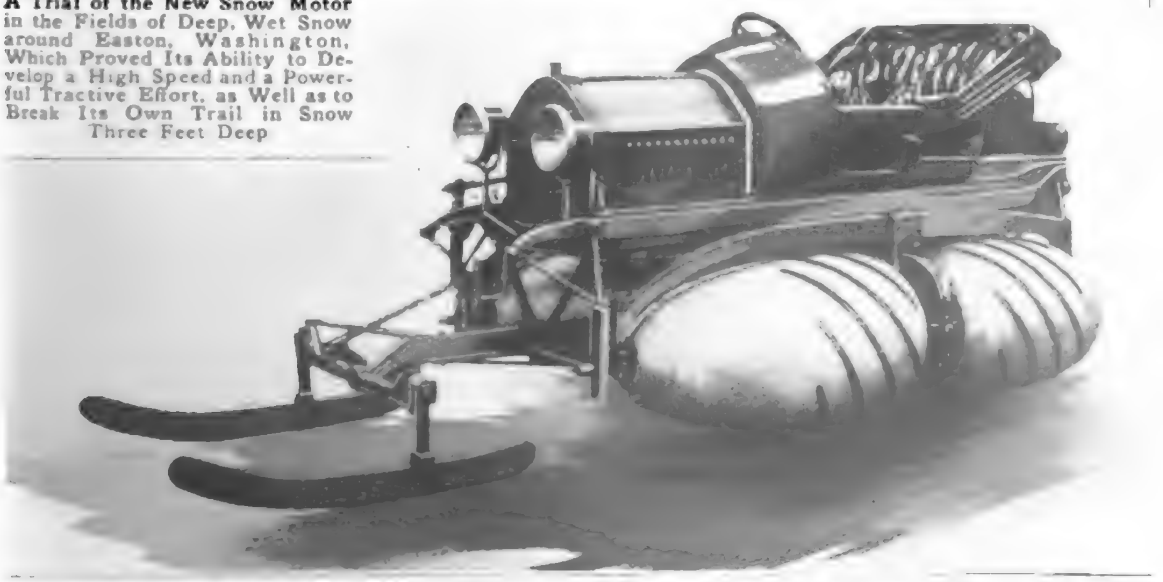
## Snow and Ice Auto Has Egg-Shaped Runners

PREPARATIONS are going forward in a western city for the commercial production of an automobile intended to run only on the snow and ice fields of northern latitudes. The traction mechanism consists of four egg-shaped drums mounted in place of the usual wheels, but with their axles longitudinal. The surface of each drum carries a series of helical flanges, like a screw thread of exaggerated pitch, those on opposite sides of the car revolving in opposite directions, driven by chains from the engine shaft. The regular gear shift is used, and ordinary runners on an extension of the frame take the place of the steering wheels. High speed and positive traction are attained by the machine.

**A Trial of the New Snow Motor** in the Fields of Deep, Wet Snow around Easton, Washington, Which Proved Its Ability to Develop a High Speed and a Powerful Tractive Effort, as Well as to Break Its Own Trail in Snow Three Feet Deep



Cross Section through Drums and Driving Gear, Showing Method of Suspension, Chain Drive, and Longitudinal Axles of Spiral-Shod Drums



**In This Full View of the Snow Motor the Arrangement of the Runners Which Take the Place of Steering Wheels, and the Extension of the Frame for Their Support are Clearly Shown. The Helical Flanges on the Egg-Shaped Drums are Also Plainly Revealed**

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## TO RESCUE TRAPPED MINERS WITH AID OF WAR DEVICE

In the latter days of the war reports emanated from France of a mysterious listening device which "heard" sounds in-

The "Geophone," Used in a Coal Mine, Enables the Listener to Detect Sounds Originating More Than a Thousand Feet Distant

audible to the ear and located their source. The same mechanism, developed to highly practical form by American engineers, has now been adopted by the U. S. Bureau of Mines for locating miners accidentally entombed. The instrument, called a "geophone," is practically a miniature seismograph. It is quite simple consisting of an iron ring closed at each side by a diaphragm of mica. In the center is suspended, by a bolt through the diaphragms, a disk of lead. A brass cap forms an air chamber at each end. To the center of one cap is attached a rubber tube with stethoscopic earpieces. The metal case, set on end on the ground, vibrates to every shock; but the lead disk, held by inertia, does not. The resulting disturbance of the mica diaphragms is communicated to the earpieces with extraordinary sensitiveness. With two instruments, one for each ear, the listener can accurately locate the source of the sound, and even identify the cause. In government tests, pounding with a sledge was located through 1,150 ft. of bituminous coal, other concussions registering in proportion.

## BOTTLE OF UNBLEACHABLE INK SENT TO PEACE CONFERENCE

The ink used in writing the American Declaration of Independence is fading so rapidly that the precious document is kept in a darkened room. Frequent experiences of this sort have induced historians to call for an unfading ink with which to record for all time the present world-peace treaty. And in response to the demand, the inventor of a famous shorthand system has dispatched to Washington, D. C., a bottle of an ink which he maintains will remain legible for thousands of years. In fact, the government chemists have declared the ink unbleachable, and the state department is said to have forwarded half a pint of the fluid to President Wilson. The imperishable ink is the result of experiments begun by the inventor's father and continued by the son after his death.

¶The city of Albany, N. Y., will probably follow Atlantic City, N. J., in the establishment of a permanent airdrome, in consequence of the selection of a local field by the government as one of the 32 official landing places.

## SEA LIONS TRACK U-BOATS BY SOUND OF MOTORS

The story of the submarine-chasing sea lions trained by the British navy is as odd as any other developed by the unusual circumstances of the last few years. The two sea lions used, a male and a female, were never credited with any "killings," yet the experiments were certainly remarkable in themselves. The general plan was to teach each animal to track a fleeing U-boat by the sound of the motors in the hope of getting food, dragging with it a conspicuous float that would reveal the position of the prey to the watchers on the surface. A depth bomb or two would do the rest.

With this end in view, the little sub chasers were fitted with muzzles, and collars to which the floats were attached, and their training was begun. They were first carried to a quiet inland lake, where they were taught, after repeated trials, to expect a feed of fish as a reward for swimming to an electric buzzer under the surface. Reaching perfection in this, they were removed to a naval base and made acquainted with their first submarine. The work here was at first much the same as before, the submarine simply lying on the surface and betraying its presence with the buzzer. Next came experiments involving a few turns of the propeller to accustom the animals to the new sensa-

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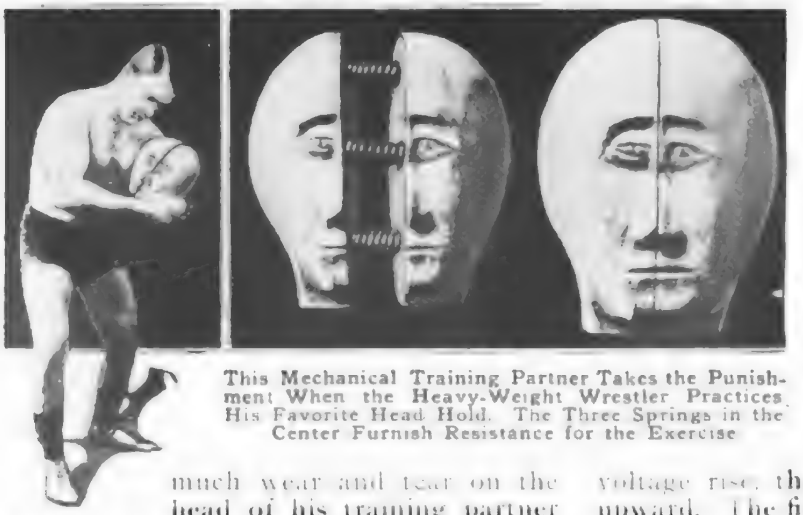
## WRESTLER PRACTICES DEADLY HOLD ON WOODEN DUMMY

A well-known wrestler's fondness for the deadly headlock was the cause of so much wear and tear on the head of his training partner that his manager was finally forced to cast about for a mechanical substitute. A wooden head was finally devised that takes the punishment uncomplainingly, and yet strengthens the athlete's arm and shoulder muscles. The head is split lengthwise to permit the introduction of three heavy coil springs.



This Mechanical Training Partner Takes the Punishment When the Heavy-Weight Wrestler Practices His Favorite Head Hold. The Three Springs in the Center Furnish Resistance for the Exercise

## INDOOR "HOLE" MAKES ANY CARPET A PUTTING GREEN

Devotees of indoor golf will thank the inventor of another little contrivance which makes the parlor carpet the best substitute known for a putting green. In principle, a heavy disk, just the diameter of the hole, is suspended on a standard at such a height that the golf ball is held firmly as it rolls underneath. Thin washers are provided, with which the disk may be adjusted for different-sized balls.

This Is the Indoor "Hole" Which Helps the Golfer to Polish Up His Putting Form. Pressure from the Heavy Disk Holds the Ball in Position

## RUNNING INCANDESCENT LAMPS IN SERIES WITH ARCS

Where incandescent lamps are used in series with arc lamps for street lighting, considerable trouble is caused by surges of current, which burn out the incandescent filaments. In the street circuits of an eastern city two solenoids are arranged with their plungers in vertical line, making and breaking contact between their ends. This regulates resistance in series with the incandescent lamps, preventing damage. With a negative surge, or voltage drop, the upper plunger falls; with a voltage rise, the lower plunger is forced upward. The filaments are thus protected both ways.

## MEMORIAL ILLUMINATION TO BE YEARLY EVENT

Crosses of light appeared on many of New York City's tall office buildings last Easter Eve, in commemoration of the allied soldiers and sailors who died for liberty. The great crosses were easily and effectively formed by allowing the lights to burn only in specified rooms, keeping the others on that side of the building either dark or curtained. Such crosses will become an annual feature.

## OUTSIDE SOUNDS INAUDIBLE WITH NEW TRANSMITTER

The release of information about the special telephone transmitter used in army and navy airplane work reveals a seeming paradox. The impossibility of using the ordinary transmitter in noisy surroundings arises, as is well known, from the impinging of extraneous sound vibrations on the diaphragm. The inventors of the new noise-excluding transmitter, two California men, in their design took a step whose logic might have been concealed by its very audacity. Stripped to its basic principles, the device is a diaphragm without a case. It shuts out impertinent sound waves by letting them in!

Analyzed, this apparent contradiction becomes sane and reasonable. Vibrations useful to a transmitter must impinge on

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The Airplane Form of the New Telephone, Immune to Noise, Appears on the Left as It is Used, While the Inserted View Indicates the Arrangement of Its Parts, the Receivers being Separate. On the Right Is the Commercial Type, with Its Two Receivers and Its Automatic Switch Stand

only one side of its diaphragm. Simultaneous impulses on both sides annul each other, and the diaphragm remains quiet. That is exactly what happens to outside noises with the new transmitter. It has a case, of course, for mechanical reasons, but one so thoroughly perforated as to be practically open. Only the desired voice vibrations, striking all on one side, retain full potency. The complete instrument includes two receivers, one for each ear.

In military work, British and French as well as American, it has been used alongside of Liberty motors running full tilt, with no trouble whatever.

This Illustration Shows That the Commercial Instrument Is No More Difficult to Use Than the More Familiar Form of Desk Telephone

Army and Navy Air Services Used Thousands of the Noise-Proof Telephones during the War, and This Picture Shows How They were Tested in the California Factory

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The Storage Battery Which Drives This Exceptionally Compact Mining Locomotive is Located under the Flat Top Plate. The Machine is Seen in Side View at the Right, While Its Applicability to Low-Ceiled Tunnels is Indicated Above

## BALANCE SCALE IS ACCURATE WHETHER LEVEL OR NOT

Since balance scales depend upon gravity for their action, it is ordinarily essential to accuracy that they rest perfectly level. This necessitates not infrequent adjustment, as all surfaces deviate more or less from the horizontal from time to time. An Ohio concern has brought out a scale whose indicator level and dial retain their positive relation to the balance even when the base is tilted as much as 30° out of the horizontal, weighing accuracy being unimpaired by this unusual position. Balancing against standard

This Scale Weighs Just as Accurately in This Position as It Does When the Base Is Level. The Indicator Centers for Exact Weight, or Oscillates to Show Over or Underweight

weights, the large and conspicuous indicator centers for exact weight, and oscillates over side graduations to show over or underweight up to two ounces.

## STORAGE-BATTERY LOCOMOTIVE DESIGNED FOR MINING USE

A powerful locomotive only 32 in. high, driven by a storage battery, has been designed by a St. Louis inventor. Its compact form makes it especially suitable for work in coal mines. The body is mounted on a four-wheel truck which it overhangs at both ends, the driver sitting sideways in the front extension. The storage battery, carried in the center of the body, is accessible yet well protected. Its capacity is sufficient for a full day's work on a single charge. With its 7½-hp. motor, the little locomotive hauls cars loaded to a total weight of 100 tons.

## WOULD TEACH AMBIDEXTERITY IN FRENCH SCHOOLS

Among many lessons France has learned from the war is one that should long ago have been obvious to the world. The necessity of teaching men injured in the right hand to use the left, and vice versa, has revealed the value of ambidexterity. Practically the entire human race is handicapped by training which makes one hand merely an unskilled assistant to the other. A surgeon has urged the French Academy of Medicine to pursue active means, through public schools and appeals to mothers, to establish instruction in the equal use of both hands as a national custom.

¶With the expected release by France of 30 Brazilian ships, it is believed that little difficulty will be experienced in inaugurating the proposed steamship service between Rio de Janeiro and San Francisco.

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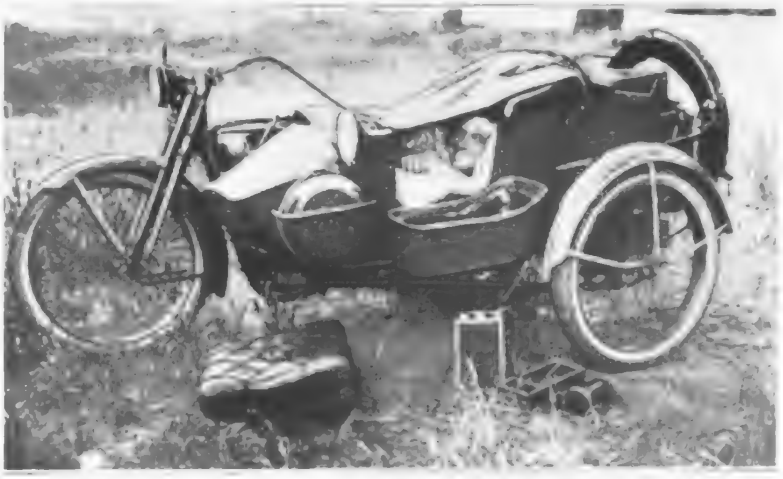
# CRIPPLED TOURIST HAS PERAMBULATING HOTEL

By JOHN EDWIN HOGG

A new motorcycle and sidecar outfit is a perambulating hotel in which all the conveniences of a home have been incorporated. It was built to the order of Alfred Leroy, a Los Angeles cripple, who has made three round trips across the American continent with similar vehicles.

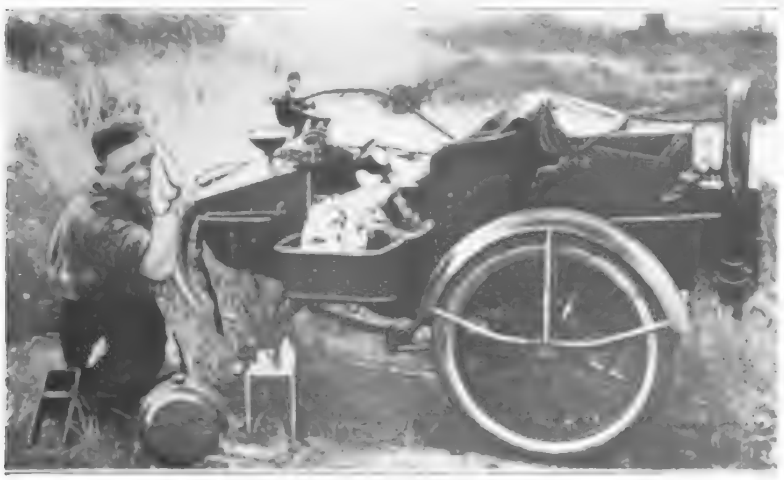


The Crippled Driver of This Outfit Finds a Comfortable Berth at Night in the Sidecar. The Bedding is Stored under the Seat in Daytime

The most novel part of the outfit is Mr. Leroy's sleeping arrangements for long cross-country tours. Taking advantage of his "abbreviated" condition, he has arranged a berth in the body of the sidecar. This consists of an air mattress, air pillow, and bedding, which, when not in use, rolls up and out of the way in the nose of the sidecar body. This rolled bedding is firmly held in place by the seat of the vehicle, which is removed when the berth is made up. Over the whole there is a canopy of rubberized material which excludes rain and dew.

A 2-gal. canteen in a metal container on the side of his machine serves the combined purpose of a carrier and an ever-handy washbasin. There is a drain hole in the bottom, and when the canteen is removed a stopper is placed in the hole, and the water from the canteen is poured into the receptacle. After the completion of toilet operations, removal of the cork permits the water to run out on the ground. In the trunk on the rear of the outfit is carried a set of cooking utensils and a few provisions.

These combinations render Mr. Leroy wholly independent of hotels or towns for a week at a time, if his fancy so dictates, and he and his dog are able to travel for days, caring little or nothing for schedules or objectives.



A Drain Hole and Stopper Convert the Canteen Receptacle at the Side of the Machine into a Washbasin, Whenever One is Needed, the Canteen Having Two-Gallon Capacity

## ENGINE, DYNAMO, AND MOTOR IN GERMAN TRAIN DRIVE

Passenger cars, designed for the railroads of Prussia and Saxony, Germany, have seating compartments at each end, and in the center a cabin containing a 200-hp. Diesel motor coupled to an eight-pole, 140-kw. generator. A separate 7½-kw. generator excites the fields and charges a 35-cell, 95-ampere-hour storage battery. The traction motors develop 160 hp. continuously, but are capable, as is the generator, of carrying a heavy overload temporarily. The car without load weighs 64 tons, carries fuel for 375 miles, and can maintain a speed of 44 miles an hour on a level and negotiate heavy grades. It accommodates 80 passengers.

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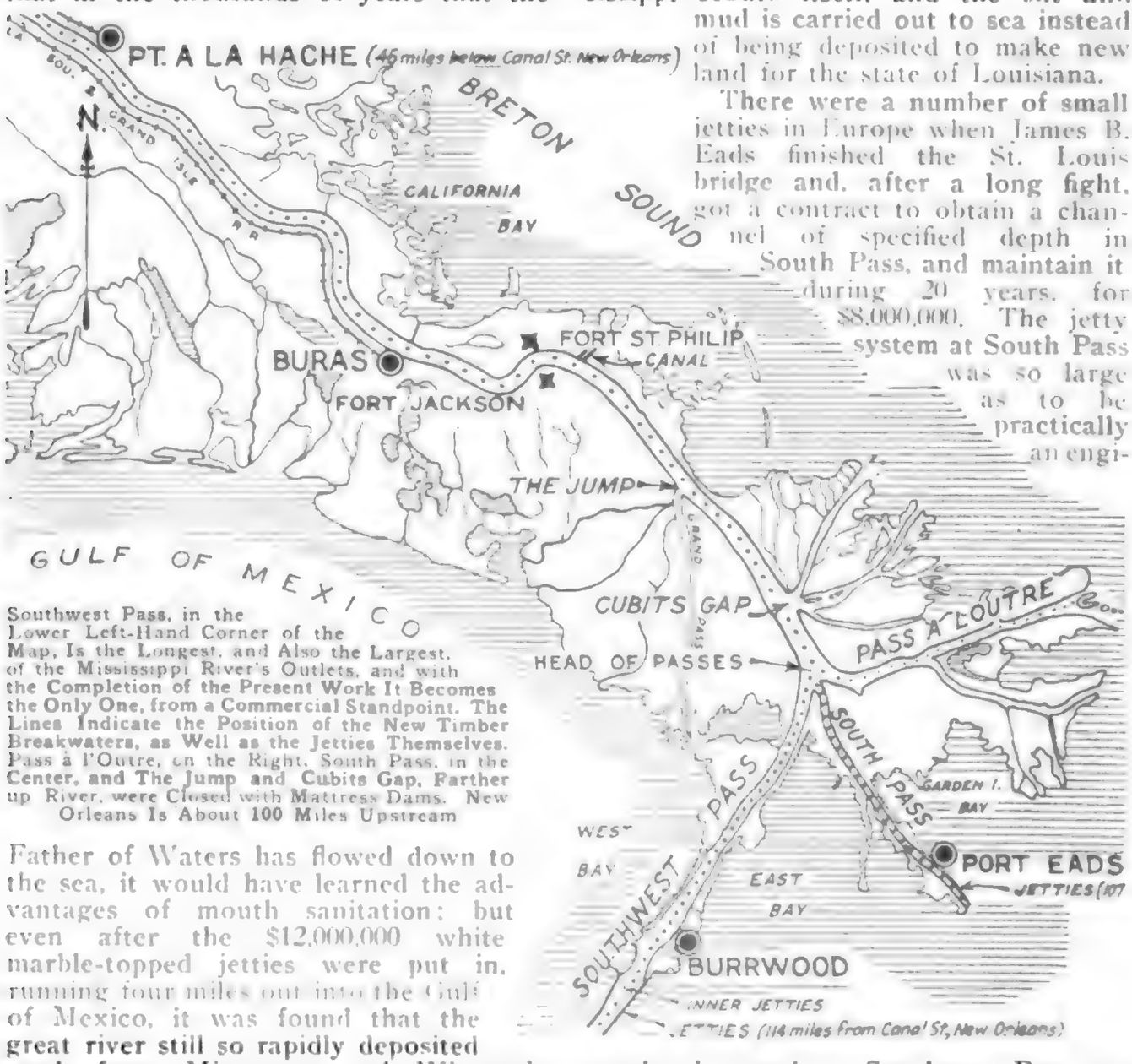
# TEACHING THE MISSISSIPPI TO BRUSH ITS OWN TEETH

By H. H. DUNN

BEGINNING the middle of this summer, the Mississippi River will be able to brush its own teeth and keep its own mouth clean of mud and silt and sand, which for so many generations have kept government dredges and other boats busy down at Port Eads holding open that mouth so that ships might pass in and out, and 100 miles up the river to New Orleans. One would think that in the thousands of years that the Father of Waters has flowed down to the sea, it would have learned the advantages of mouth sanitation; but even after the $12,000,000 white marble-topped jetties were put in, running four miles out into the Gulf of Mexico, it was found that the great river still so rapidly deposited earth from Minnesota and Wisconsin and Iowa and Arkansas and other states, that it required millions more to let shipping through the passes. So it was not until this year of 1919 that a means was devised to make the old river clean its own channel.




Southwest Pass, in the Lower Left-Hand Corner of the Map, Is the Longest, and Also the Largest, of the Mississippi River's Outlets, and with the Completion of the Present Work It Becomes the Only One, from a Commercial Standpoint. The Lines Indicate the Position of the New Timber Breakwaters, as Well as the Jetties Themselves. Pass à l'Outre, on the Right, South Pass, in the Center, and The Jump and Cubits Gap, Farther up River, were Closed with Mattress Dams. New Orleans Is About 100 Miles Upstream

The method was very simple—after they found out how to do it—for it consisted merely in narrowing the channel inside the jetties, by means of timber breakwaters, to 1,000 ft., with a mean depth of 35 ft., and then directing the main current of the Mississippi through this narrowed channel. Only one dredge will be required now for soundings and records, whereas three or four dredges were employed before to keep the channel clear. Now the current of the Mississippi scours itself, and the silt and mud is carried out to sea instead of being deposited to make new land for the state of Louisiana.

There were a number of small jetties in Europe when James B. Eads finished the St. Louis bridge and, after a long fight, got a contract to obtain a channel of specified depth in South Pass, and maintain it during 20 years, for $8,000,000. The jetty system at South Pass was so large as to be practically an engineering innovation. Southwest Pass was abandoned when Eads finished at South Pass, about 40 years ago. But in 1903, seeing that the average depth of ships was increasing and that the tendency was decidedly toward deep draft, the government began a jetty system for Southwest Pass, much larger than the Eads jetties. It is being used now; but



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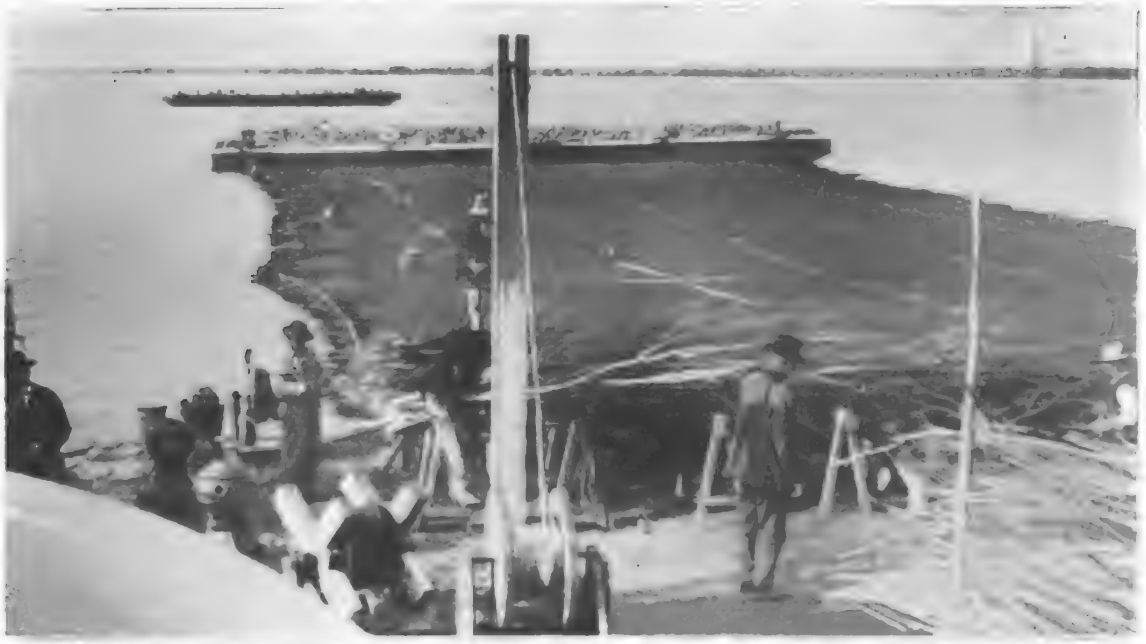

This Shows the Way in Which the Willow Mattresses are Constructed, of Trees Bound Together with Iron Bands and Steel Rope. The Scow in the Middle Distance is Dropping Stone on the Mattress as It is Rolled off the Weaving Scow in the Foreground. The Willow Trees are Cut along the Banks of the River, and Since Green Willow Keeps Virtually Forever in Fresh Water, the Mattresses Are Practically Imperishable

when the construction innovations are completed, more than 99 per cent of the world's ships will be able to come safely and swiftly into New Orleans in unfavorable conditions of wind and tide and river level, and all but eight of the Atlantic liners will be able to do so when the conditions are favorable.

The jetties, running from the mouth of Southwest Pass into the gulf, are 6,000 ft. apart at their head and 3,600 ft. apart at sea line. The Mississippi has three main mouths, with two other minor mouths. Southwest Pass takes 50 per cent of the traffic; South Pass handles 14 per cent, and Pass à l'Outre takes care of the balance. To make Southwest Pass self-cleaning, the other passes were closed with sunken dams, on mattresses of willow trees, bound together with wire, in 200-ft. sections, and weighted with stone, so that the main force of the current was directed into Southwest Pass. Then the wooden bulkheads were built, 1,000 ft. apart, and the great stream turned into this channel, about one-fifth as wide as the old channel between the jetties, yet wide enough to handle all the traffic. Two hundred men have been employed for nearly three years on this work and they have driven approximately 10 miles of sheet-piling bulkhead, employing 13 cargo barges, three tugs, three floating derricks, and two floating pile drivers on the job.

The cut-off dams which have been put in at The Jump and at Cubits Gap, the other two mouths of the Mississippi, as well as at Pass à l'Outre, consist of willow mattresses, weighted down with rock from the Gantt marble quarries in Alabama, brought on barges down the Black Warrior River, through Mobile Bay, Mississippi Sound, Lake Borgne,

The "Jumping-Off Place" of Southwest Pass, the End of the Jetty System Out in the Gulf of Mexico: The Visible Portion, Surmounting the Substructure of Mattress and Piling, Consists Mostly of Fragments of Marble from the Quarries on the Black Warrior River in Alabama

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and Lake Borgne Canal into the Mississippi, and thence down that stream to its mouth. One hundred and twenty feet deep at New Orleans, the river has

One of the Completed Sections of Breakwater inside the Jetty on the Right-Hand Side of Southwest Pass: The Method of Construction with Sheet Piling, Heavy Timber Walings Bolted to the Piling, and Stout Angle Braces, is Clearly Shown. The Dark Line in the Distance Is the Opposite Breakwater

so filled itself with mud that when these inner bulkheads were started, the natural average depth through the passes was only nine feet, and they were kept open to traffic only by the strenuous efforts of a fleet of government dredge boats. Now the river is keeping itself open, through the greater flow of water forced through South and Southwest passes.

The willow mattresses on which these cut-off dams rest are interesting. Mattresses are woven on barges anchored where they are to be laid, and as it is rolled off the barge, another barge, coming behind, drops onto it tons of stone in blocks of 100 to 150 lb. each. The willow for these mattresses is cut along the banks of the river, and is used because green willow keeps virtually forever when immersed in fresh water. Rolls of these green willow trees are laid side by side on bands of steel wire, one-quarter inch in diameter, each roll being bound together itself with band iron. Then a woof of heavy steel wire is run through and the mattress slipped off the barge until the desired length is reached. These mattresses are made in sections, usually 200 ft. wide, but ranging in width, when complete, from 500 up to 2,000 feet.

As soon as a section is laid and covered with stone, the weaving barge passes back over it, dropping another section of mattress, while the stone barge follows, laying another layer of stone,

Fragments of Marble Brought from the Alabama Quarries by Barge: This Is Part of the Material Used as Ballast to Give Solidity to the Timber Breakwaters along the Inner Channel of Southwest Pass, and Also for Weighting Down the Willow Mattresses of the Cut-Off Dams

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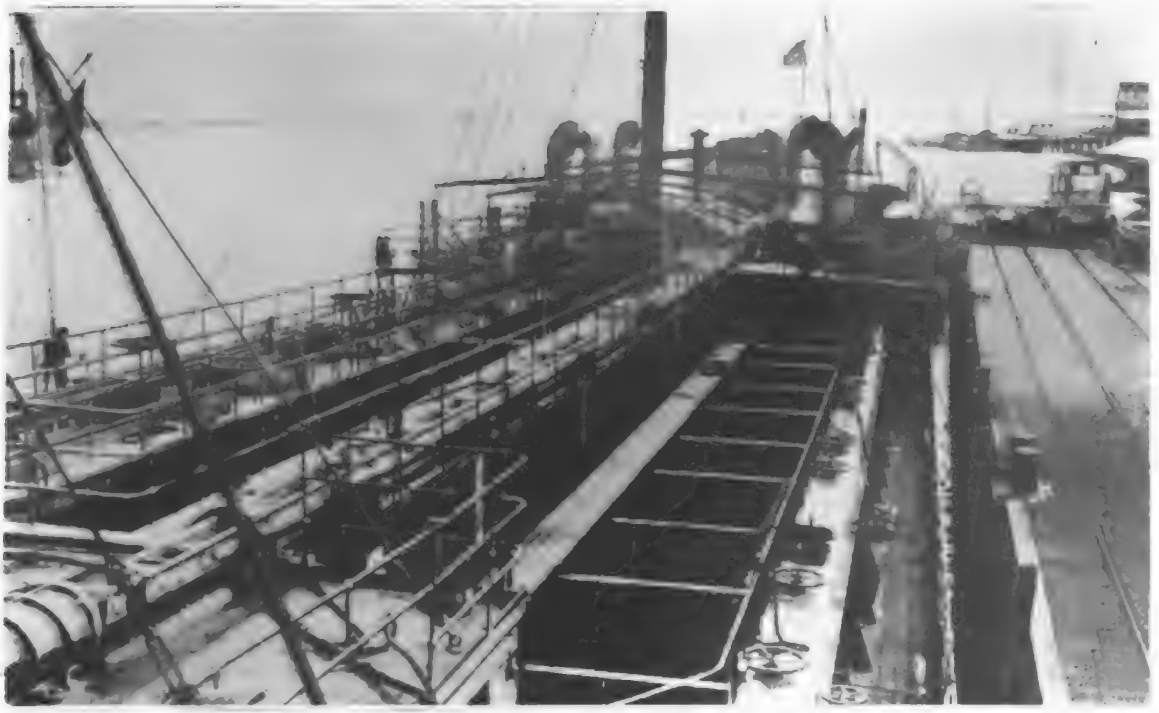

That the United States Dredge "New Orleans" Is a Craft of No Mean Proportions is Revealed by This Picture. The Vessel Is of the Hopper Type, Its Large Capacity Being Apparent from the View of the Open Hoppers along the Near Side. They are Emptied, of Course, through the Bottom When the Dumping Ground is Reached. Some of These Mississippi River Dredges Are Quite Large, Having a Capacity of Over 1,000 Cubic Yards an Hour

this operation being repeated until the desired height is reached. Usually this is about three feet below the surface of the stream, so that the river will find relief in periods of high water and not send down such a flood as to tear out the wooden breakwaters which guide the stream into the gulf. On top of the uppermost layer of mattress is laid a final cap layer of five-ton blocks of marble from the Alabama quarries, and of stone taken from wrecked buildings in New Orleans. Notable among the latter are the stone, and some of the huge stone figures, from the old Cotton Exchange building, which has been torn down to be rebuilt in exact duplicate of its original appearance, but with better inside accommodations.

The "Business End" of the United States Dredge "New Orleans," Showing Part of the Dredging Equipment

Spur dikes are scattered all up and down the passes, to catch silt and earth along the main jetties, so as to build up more artificial land, and forcing the main current still farther out between the wooden bulkheads. The first improvement of Southwest Pass was made in 1836, and it is estimated that in 50 years the river will have deposited so much silt that all the space between the original marble-topped jetties and the wooden bulkheads will have become solid, arable land. This means the rescue from the river of two strips of land each five miles long and 2,000 ft., or more, wide; a considerable area of the best soil in the world, probably worth to the state of Louisiana nearly as much as the financial outlay on the improvement of Southwest Pass, and capable of being converted into a summer resort, five miles out in the

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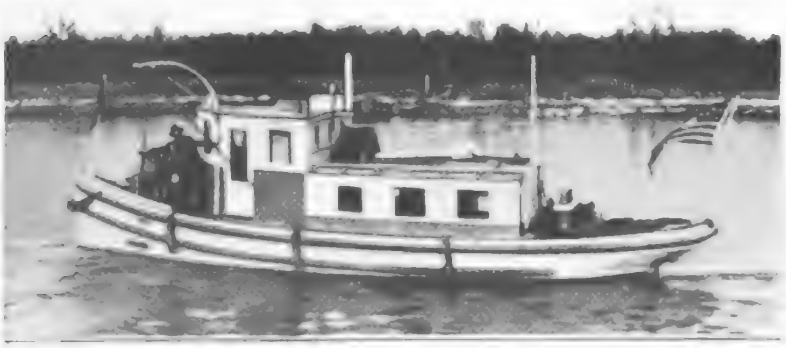
**The Extensive Preparations for an Increased Commerce through the Mouth of the Mississippi All Comprise Government Work, and This Group of Temporary Structures Is a Section of the Government Camp on the River, at the Head of the Passes**

gulf, free of mosquitoes and other insect pests that infest the inland watercourses.



**Launch Used by the Squad of Engineers Whose Task It Is to Take Soundings in the Channel and Measure the Velocity of the Current**

These wooden bulkheads are heavy structures of creosoted timbers, 14 by 14 in., each from 40 to 60 ft. long. The sides toward the channel are of special sheet piling, a sort of interlocking, continuous water fence, solid below the mean water line, and cut open above at alternate timbers to allow the water to pass through freely, and, by this means, to relieve them of the strain of the smashing waves which come rolling in off the gulf. Inside the sheet piling, one six feet above, and the other midway between mean low and mean high-water levels, are longitudinal connecting timbers, walings bolted firmly to the heavy piles. Inside this whole fence is a supporting row of piles, driven at an angle, still further to strengthen the bulkhead against the waves. The combined length of these bulkheads is 52,250 ft., or in the neighborhood of 10 miles.

The work maintains the very existence of New Orleans, and permits the continuance of the whole water-borne commerce of the Mississippi Valley. More than that, it opens practically a new gateway for big ships to the upper waters of the river, where other plans are being developed for the purpose of preparing and maintaining an adequate path for increasing trade possibilities.

**Close View of the Finished Jetty, with Its "Marble Top" Consisting of Thousands of Tons of Rock Fragments, All Brought at Least a Hundred Miles by Barge**

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## MAKERS EXPECT DEMAND FOR SMALL SPORTING AIRPLANE

In their efforts to continue production on something like war-time scale, the manufacturers of airplanes seem to incline to the construction of two distinct types, the huge multimotored plane for commercial purposes, and the small ship for sporting use. Perhaps they place most faith in the latter, with its easy operation and small storage space required, as the best stimulant to a popular demand. At any rate, many small models have appeared on the commercial market, among them the Graham White Bantam single-seater shown in the illustration, driven by an 80-hp. rotary motor at more than 100 miles an hour. The little "bus" is only 16 ft. 9 in. long. The tanks carry gasoline and oil sufficient for a three hours' flight.

This Fast Little Single-Seater may be Housed in a Small Space, as It Has a Span of Only 20 Feet and a Length of 16 Feet 9 Inches. The Upper Plane Lies Level with the Pilot's Eyes

## PROJECTED TEN-MILE RAILWAY OPENS VAST TIMBER TRACT

A railroad extension only 10 miles long, promised for completion this summer, has aroused in the city of Chehalis, Wash., anticipation as keen as might a transcontinental trunk line. The reason is that the new spur will tap a belt of virgin timber estimated to contain not less than 20,000,000,000 ft. of fir and cedar. The construction will begin at the terminus of an existing line 19 or 20 miles long, so that the completed road will run about 30 miles southeast of Chehalis, toward Mount St. Helens. Cowlitz and Green rivers, and several creeks, are the waterways whose lumbering facilities will become tributary to the new road, and help distribute work and prosperity along its short path.

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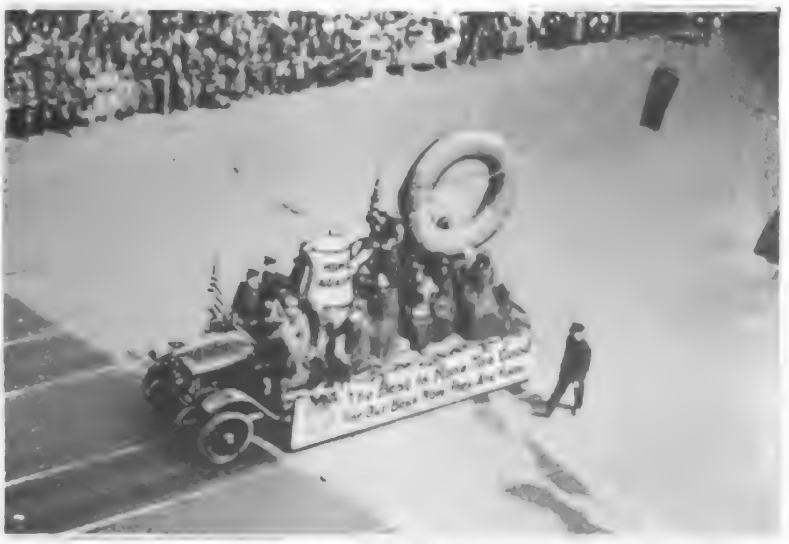
¶When the fighting was at its height, the Signal Corps of the United States Army was using, among other things, approximately 68,000 miles of outpost wire a month.

## SALVATION ARMY FLOAT RECALLS WAR SERVICE

"Java and sinkers" from the hands of a smiling Salvation Army lassie filled with gratitude the heart of many a battle-worn doughboy not many months ago. He will certainly never forget his appreciation of the kindly service nor his relish for the home-cooked dainties. This immortal combination was recently made the decorative feature of an artistic float that formed part of a large parade.



Nobody Applauded This Float More Than the Boys Returned from France, Who had Eaten the Salvation Army's Peerless Pies and Doughnuts, Right under "Jerry's" Nose, Only a Few Months Before

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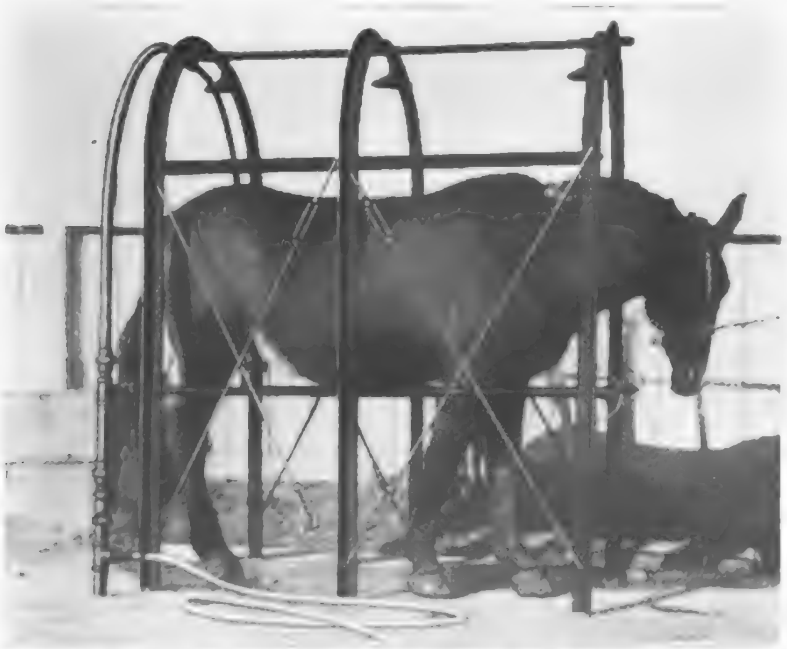
## MULES ENJOY REFRESHING SHOWER BATH

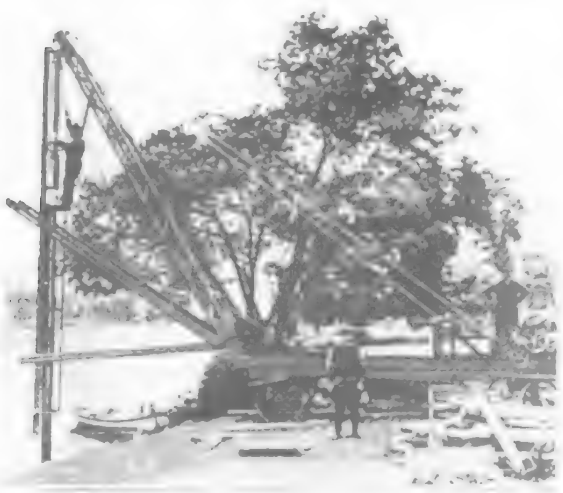
One mine owner gives each of his mules a thorough shower bath after the work underground has been completed. The mules are said to take keen pleasure in this humanitarian treatment, which not only keeps their coats clean and healthy, but even makes them more fit for work on the following day. The shower bath has three sprays.



**On being Released from Duty in the Mine the Mules Run to This Shower Bath of Their Own Accord. The Treatment Keeps Them Clean and Fit for the Work of the Following Day**

## RAINBOW COLORS OF INSECTS EXPLAINED BY SCIENCE

The phenomena of insect coloring which sometimes make the lowly beetle, seen in the sunlight, a thing of iridescent beauty have been studied and divided into three classes. Among the first are the insects which owe their color to chemical causes, like the caterpillar whose body is tinged by the greenish substance, chlorophyll by name, contained in the leaves it feeds upon. On the other hand, the color in the wings of a dragon fly is largely caused by the varying thickness of the membranes, which act as prisms, diffracting the white light into its prismatic colors. But in the third class, embracing those colored by both chemical and physical causes, are found the most interesting specimens. Thus the beetle from Costa Rica, which seems to be made of tin, and the beetle from Australia, which would pass anywhere for pure gold, both look as they do because they wear a coat which not only contains a coloring pigment, but is also overlaid by a polished refractive surface.



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**This Collapsible Army Pile Driver is Mounted on Wheels for Quick Transportation to the Scene of Action. Power is Supplied by a Small Gasoline Engine**

## SMALL MILITARY PILE DRIVER ADAPTED FOR OPEN WARFARE

As wars are fought nowadays, the pile driver's contribution to victory may often be as essential as that of the big guns. The machine in the illustration is of the type recently designed for military use, chiefly in open warfare, where its mobility and ease of operation should make it a valuable and essential piece of engineering equipment.

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¶ In recent Signal Corps experiments, 11 telephone and eight telegraph messages were sent simultaneously over a single wire. One telephone current traversed the wire, the other 10 consisting of radio waves confined and guided by it. The telegraph was multiplexed, four messages in each direction.

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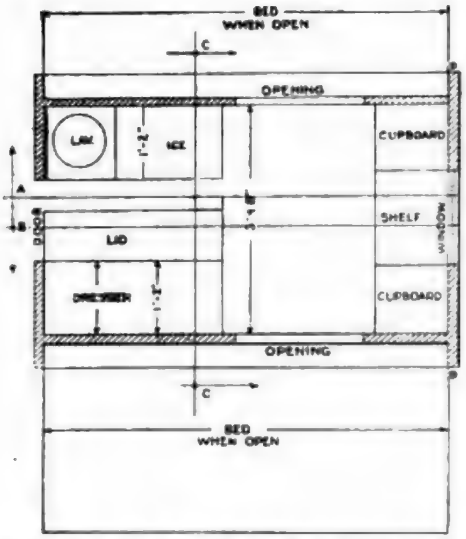


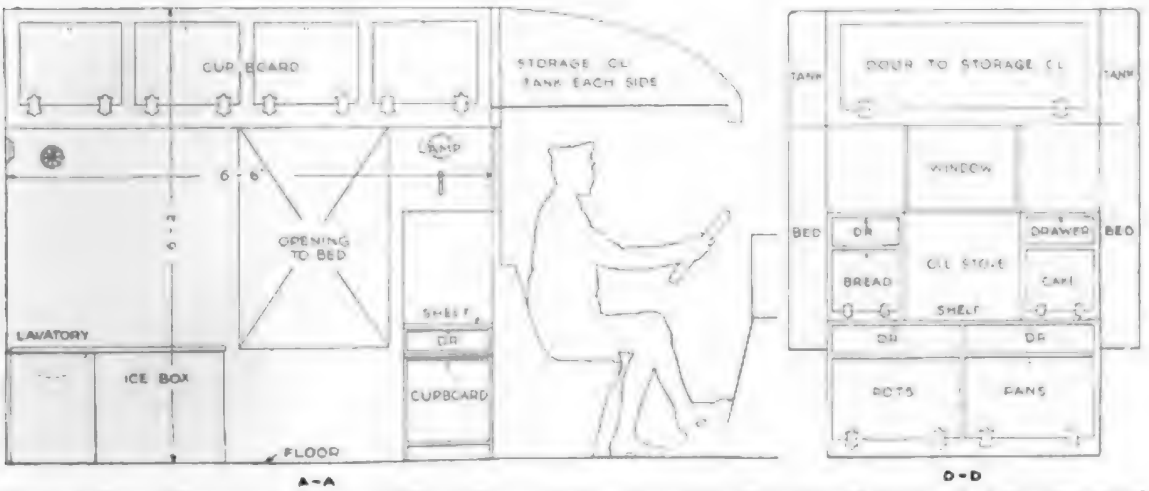
Plan View of Body Back of Driver's Seat, at the Left, Indicates Location of Lavatory, Ice Box, Dresser, Cupboards, and Beds, While the Right View Shows One Bed Opened, with a Certain Well-Known Movie Player Sitting upon It. Through the Opening at His Back Is a Glimpse of the Stove

## BEDS, LAVATORY, AND KITCHEN IN SMALL AUTO

That it is possible to include within the narrow confines of one of the smallest of autos such home comforts as beds, library, lavatory with hot water and shower, and 15 days' supply of food, has been demonstrated by the camp-loving brother of a noted motion-picture comedian. To accomplish this purpose, every inch of space in body and top has been utilized. The two beds open like bunks from the sides of the body. In front is a kitchen, with oil stove and pantry, including bread and cake boxes and cupboards for pots and pans. Lavatory and ice box are at one side, a dresser occupying the corresponding space at the other side. The fixed top is full of cupboards, and even the peek just above the driver's head contains a large storage closet and a tank at each side.

## BLIND MAN INVENTS DIRECTION INDICATOR

When a Seattle young man of 26 met with an accident in 1916 which resulted in the loss of his eyesight, he immediately set to work to try to evolve a mechanical device which would be, as near as possible, a substitute for eyes. After almost two years of patient effort, he has perfected an instrument which enables him to get about without the use of a cane.




Side and Front Elevations, Left and Right, Respectively, Reveal the Remarkably Compact Arrangement of Necessities and Conveniences in the Small Body of the Car. The Multiplicity of Storage Cupboards and Drawers Is Especially Noteworthy

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and the device has possibilities for use in navigation on land, on the sea, or in the air.

The inventor calls his mechanical "eye" a direction indicator. The device is worn attached to his belt and it literally keeps

**The Apparatus Hung on the Blind Man's Belt Enables Him to Travel in a Given Direction. A Compass Needle Rings a Right or Left-Hand Buzzer When He Deviates from His Course**

him on the "straight and narrow path." The direction indicator comprises a specially constructed compass, two buzzers, right and left, and two dry-cell batteries, and is attached to the belt by clips. The compass has an adjustable cap, which is turned as desired. A notch indicates "north." Two pins are suspended from the cap or cover, and this is mounted over the needle of the compass when it is set. If the wearer deviates from his set course, the compass needle comes in contact with the pin on the opposite side, closing a circuit, and the buzzer on that side sounds a warning.

The compass can be set for any direction and can be changed when desired. It should prove invaluable to the timber cruiser or surveyor, or to the traveler in the desert. It is difficult for men traveling in heavy timber or on the desert to maintain a set direction. But the wearer of the direction indicator would determine his course before starting out, and the buzzers would warn him every time he deviated from that course.

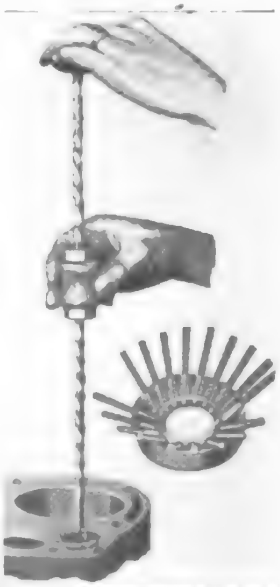
Plans to incorporate the device in boats and air craft, as a means of automatically controlling their direction, are being developed. Instead of sounding an alarm when the craft veered from its course, the indicator would close a contact which would throw over a rudder. The inventor believes that a positive guide for automatically controlled torpedo or bombing craft would thus be afforded.

## RAILROAD ADMINISTRATION TO SELL SUMMER TICKETS

The Railroad Administration has authorized the publication, on the Pacific coast, of low round-trip summer-tourist fares to practically all the resorts in the far-western states to which it has been customary to sell summer tickets in the past. Reduced-rate tickets good for three months from date of sale may be purchased from May 30 to September 30, inclusive, presumably with October 31 as a time limit. At a greater reduction, fifteen-day tickets will be sold on Fridays and Saturdays between those dates, to points within a radius of 400 miles.

## ROLLING FILES GRIND VALVE IN NEW ENGINE TOOL

A new and ingenious tool for grinding engine valves, consists essentially of a series of 12 tiny round files with very fine teeth. These are radially mounted, free to revolve in a small ring, forming a conical group. This ring is inserted in the valve seat. The valve is then centered in the ring, and revolved several times by means of a long, twisted spindle, upon which a grooved sleeve is moved up and down, with light pressure. The surfaces are polished by rotating the spindle between the palms of the hands. The whole operation is completed in three or four minutes.



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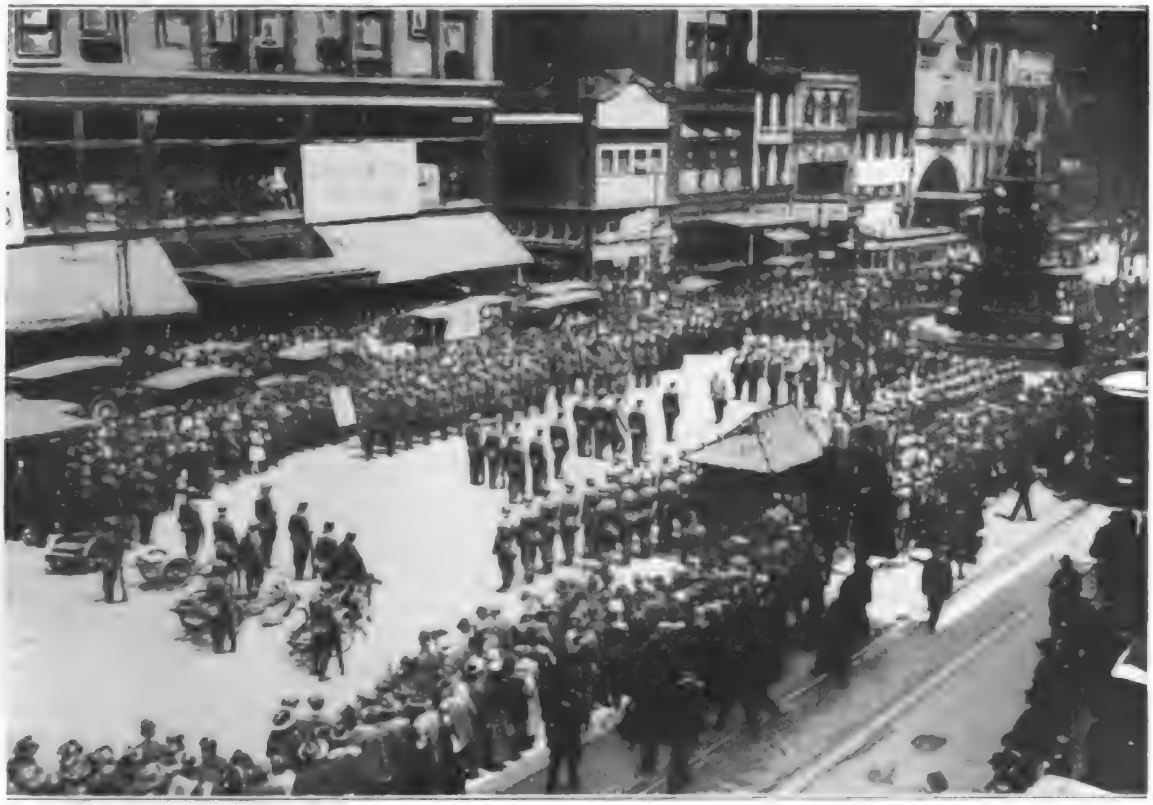

The French Consul at Cincinnati Decorating an American Captain of That City for Bravery in Battle, in the Presence of French, Belgian, and American Troops

## AMERICAN HONORED BY FRENCH CONSUL IN CITY STREET

A busy down-town street in Cincinnati was recently the scene of an occurrence which symbolized strikingly America's present unprecedented relationship with two great foreign powers. Stopping all traffic and pressing back the crowd, the police made way for detachments of French, Belgian, and American soldiers. A hollow square was formed, into which stepped an American captain, late of the A. E. F., accompanied by the local French consul and a number of civic dignitaries. With the usual simple ceremony, the Frenchman pinned the croix de guerre on the American's breast.

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## GERMAN PEACE DELEGATION KEPT IN FRENCH CORRAL

Whether its purpose was to keep them in, or to keep an unfriendly populace out, or both, the German delegates to the peace conference at Versailles, France, were confined in a barred inclosure which surrounded their headquarters, Hôtel des Reservoirs. Wires, stretched between posts and carrying two tiers of pickets of sharpened wood, made a fence, between 6 and 7 ft. high, whose line was constantly patrolled by French gendarmes, for the protection of the visitors.

Picket Fence Built around the Hôtel des Reservoirs, Versailles, France, to Protect—and Confine—the German Peace Delegates; and a Gendarme on Guard

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The Navy's Transatlantic Seaplanes, the "NC-3," "NC-1," and "NC-4," as They "Taxied" for the Start from Rockaway Beach, on May 8, 1919: The Flight to Newfoundland was Made with Ease, Only the "NC-4" being Delayed by Engine Trouble. Yet It Caught Up with the Leaders, and Was the Only One to Arrive at the Azores as Scheduled. Its Crew is Pictured from Upper Left to Lower Right: Lieutenant Commander A. C. Read, Officer in Charge and Navigator; Lieutenants Stone and Hinton, Pilots; Ensign Rodd, Radio Operator; Chief Special Mechanic Howard, Later Replaced by Chief Machinist's Mate Rhoades, and Lieutenant Breese, a Reserve Pilot Left at Newfoundland

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# THE TRANSATLANTIC FLIGHT

## Daring Failures and Brilliant Successes Blaze Aviation's Way across the Ocean

By PAUL A. JENKINS

THE whole world heeded the call of red-blooded romance in the month of May, 1919. While thousands watched the bulletin boards and scanned the headlines in Europe and America, while preparations for similar attempts could be heard on both sides of the Atlantic, fifteen square-shouldered young officers of the United States Navy raced above the clouds, through fog and rain, for the Azores; a gallant young Englishman and his companion accepted the challenge and flew from Newfoundland into the darkness, as two others crashed in an attempt to follow.

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**HARRY G. HAWKER**

**The Fearless Pilot of the Sopwith Transatlantic Biplane was Lured Years Ago from His Automobile Business in Australia to the Infant Airplane Industry in England. He Crowded Much into the Period of His Aerial Experience. In 1912 He Flew a Primitive Biplane Continuously for Eight Hours and 23 Minutes. In 1916 He Set a British Altitude Record of 24,400 Feet**

The United States Navy began to study the possibilities of transatlantic flight in 1917. Busy as the officials were with the perplexing difficulties of sending hundreds of sub-chasers, destroyers, and battleships to the fighting overseas, they realized that some day would come a similar call for ships of the air. So, even in the midst of war, the experts drew apart and commenced their scientific study of suitable airplane design, and of the uncharted winds that sweep the upper air.

Of immediate importance was the problem of designing strong, powerful planes which would leave the coast of America with the certainty of reaching the other side. After collaboration with the engineers of a famous airplane-producing corporation, a design was accepted, and on May 3, 1919, after test performances which astonished airmen both at home and abroad, three of the great planes which were to make the attempt together were commissioned as regular seagoing ships of the United States Navy, at Rockaway Beach Naval Air Station, Long Island.

As commissioned, the "NC-1," "NC-3," and "NC-4" are essentially a combination of a stanch, seaworthy hull, with a biplane of large size and sturdy construction. Each hull is 44 ft. 9 in. long and consists of an oak and spruce frame covered by a planking of spruce or cedar. In this hull are places for five men: a navigator with his charts and various observation instruments, in the extreme bow; back of him the two pilots, each with a complete set of controls; back of them nine aluminum gasoline tanks holding 200 gal. each, and toward the stern the wireless operator and engineer with their equipment.

The upper and lower wings are of different length, the upper wings with a total span of 126 ft., the lower measuring

The Map Shows Clearly the Path Plotted for the Three Big Seaplanes of the United States Navy on Their Jour Trip to Newfoundland, How They Flew Thence through the Darkness on the Night of May 16, and How Th "NC-4" Alone Reached the Azores Intact. The "NC-1" Landed in a Stormy Sea Far to the North of Fay Still Worse. Landing Like the "NC-1" in a Choppy Sea, but Many Miles to the South of the Azores. It W Only Skillful Navigation, and the Strictest Economy of the Little Gasoline Remaining Made Possible the Sh

32 ft. less. The distance between wings is 14 ft. at the center and 12 ft. at the tips of the lower wings. Between the upper and lower planes are the four 400-hp. Liberty engines which drive three puller and one pusher propellers, of the peculiar, heavy Olmstead two-blade pattern. It must be remembered that all these power plants are accessible during flight through hatches in the hull and ladders in the rigging.

The navy thus provided its airmen with the best in hull, planes, and motors. But it was realized that these were useless unless supplemented by the most effective and accurate means of communication and navigation. To insure unfailing communication, a triple radio outfit was installed in each boat. Of first importance was the telephone system, with its noise-excluding receiver and transmitter sewed into the helmet of each of the crew. To truly realize the nerve-racking flight these men made on the days in May, one must recall that the four Liberty engines maintained a continuous deafening roar from beginning to end of each leg of the journey. The necessity for this means of communication is evident.

In addition, each ship was fitted with the usual long-distance radio telegraph, and with the improved radio compass, or direction indicator. Storage batteries also operated a lighting system in the hull.

**This Is the Sopwith Biplane Which Left Newfoundland on May 18, 1919. It Is Practically a Standard Design, Except That the Cockpit for Both Pilot and Navigator is Set Far Back of the Engine to Give Room for the Huge 330-Gallon Gasoline Tank. It will Also be Seen That the Rear Covering of the Fuselage is Formed by the Hull of a Small Lifeboat Which may be Unstrapped in Case of Emergency**

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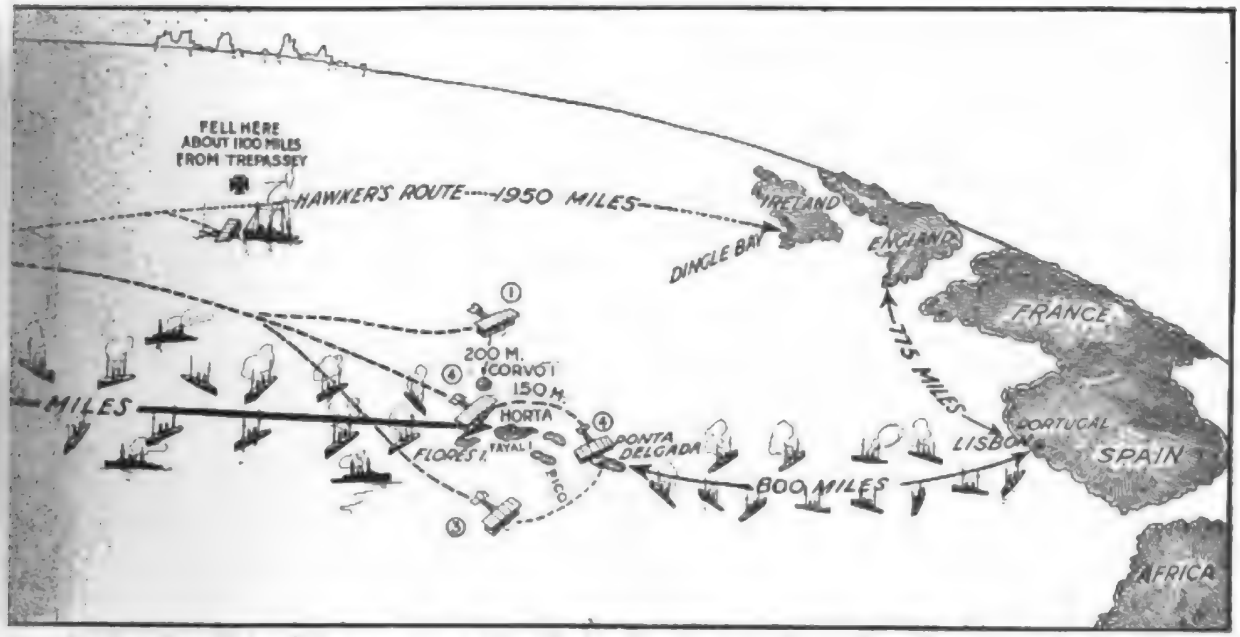
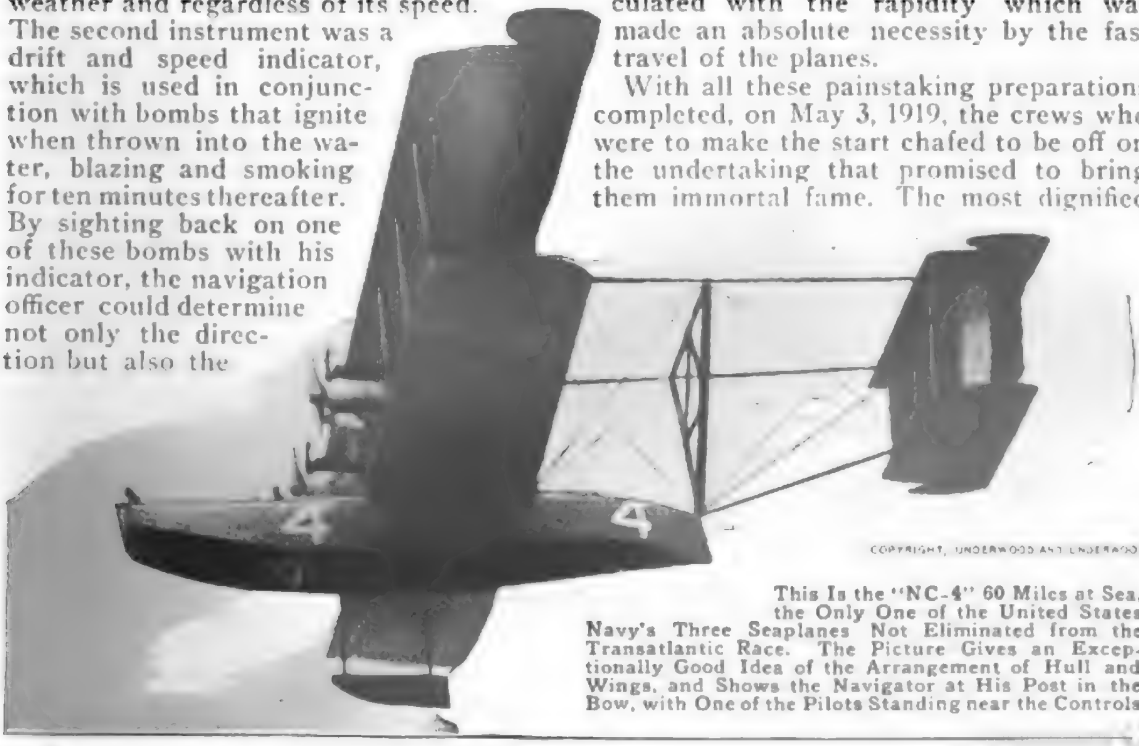



over the Guardian Chain of Destroyers from New York to England. It Shows How They Made the Experimental Parted Shortly after Dawn, Later Meeting the Unexpected Fog Which Kept Two of Them from Their Goal. The Breaking Wings and Hull so That It Sank Several Days Later While being Towed to Port. The "NC-3" Fared Unable to Rise Again. Its Wireless Being Ineffective, the Plane was Mourned as Lost for Two Days and Nights. Journey to Ponta Delgada. The Chart Also Shows the Projected Route of Hawker's Attempt and Where He was Rescued

And for the use of the all-important navigating officer at his post in the bow, three new instruments were devised. The first, the aerial sextant, used a bubble in a tube in place of the horizon, which is often obscured by clouds or else is too dim to be spotted. The instrument thus enables the navigator to ascertain the exact location of his ship in all kinds of weather and regardless of its speed. The second instrument was a drift and speed indicator, which is used in conjunction with bombs that ignite when thrown into the water, blazing and smoking for ten minutes thereafter. By sighting back on one of these bombs with his indicator, the navigation officer could determine not only the direction but also the velocity of the wind, and was thus able to make the correct allowance for drift in figuring his course. And thirdly, each navigator was given a course and distance indicator which obviated almost all the usual mathematical calculation. Equipped with these instruments and the best charts the navy could compile, it was possible for the positions to be calculated with the rapidity which was made an absolute necessity by the fast travel of the planes.

With all these painstaking preparations completed, on May 3, 1919, the crews who were to make the start chafed to be off on the undertaking that promised to bring them immortal fame. The most dignified

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This Is the "NC-4" 60 Miles at Sea, the Only One of the United States Navy's Three Seaplanes Not Eliminated from the Transatlantic Race. The Picture Gives an Exceptionally Good Idea of the Arrangement of Hull and Wings, and Shows the Navigator at His Post in the Bow, with One of the Pilots Standing near the Controls

Google

gold-striper and the humblest mechanics at the air station shared their enthusiasm and impatience. So the gasoline fire which consumed a wing of the "NC-1" and ate an elevator from the "NC-4" on May 5 was a tremendous blow to everyone. But Commander John H. Towers, the resourceful young "admiral" of the air fleet, was undaunted. Telephoning the base plant, he ordered that the "NC-2" be further dismantled, to furnish wings for the "NC-1" and elevators for the "NC-4." Working feverishly all night, the loyal mechanics pointed with pride in the morning to three ships ready to start once more.

But not till two days later, till the morning of May 8, was the word given by the

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In the Upper Picture will be Seen the Quadruple Power Plant of the "NC-4" Which Drove Her without a Stop from Newfoundland to the Azores. Each Engine Received a Propeller. Three Arranged as Pullers and One as a Pusher. In the Center is Shown the Bow of the "NC-3" Fitted with Torches for Night Landings, and Below Is Its Crew. From Left to Right They Are: Commander John H. Towers, Officer in Charge and Navigator; Commander Richardson and Lieutenant McCullough, Pilots; Lieutenant Commander Lavender, Radio Operator; Machinist Moore, and Lieutenant Rhodes, a Reserve Pilot Who was Left at Newfoundland

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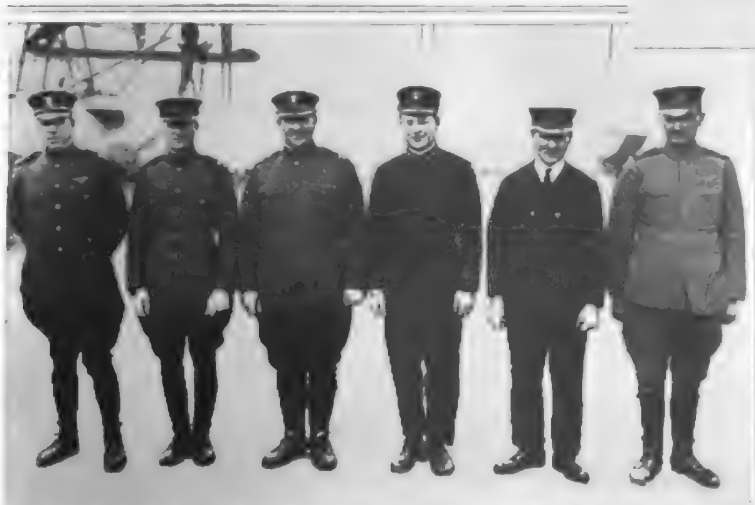
weather bureau. That day being fair, the division rose from the water at Rockaway Beach, while members of the post and a privileged number of civilians stood quietly along the shore, too impressed to cheer. The flagship "NC-3," under Commander John H. Towers, took the air at 10:02 a. m.; the "NC-4," Commander Albert C. Read, at 10:03 a. m., and the "NC-1," Commander Patrick N. L. Bellinger, at 10:09 a. m. Assuming a wedge formation, the "NC-3" in the center, they headed northward and soon were lost to the sight of the watchers.

The trip to Halifax was, on the whole, an uneventful but instructive experience. The division kept formation till north of Cape Cod, where the "NC-4" developed trouble in



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At the Top of the Page Two Tractors are Seen Drawing the "NC-1" Ashore after a Practice Flight at Rockaway Beach, Long Island. The Two Pilots in the Center are Using a Plumb Bob in the Careful Adjustment of Their Compass. In the Lower Picture, Standing before Their Plane Which Now Rests on the Ocean Bottom, Is the Crew of the "NC-1." From Left to Right They Are: Lieutenant Commander P. N. L. Bellinger, Officer in Charge and Navigator; Lieutenant Commander Mitscher and Lieutenant Barin, Pilots; Lieutenant Sadenwater, Radio Operator; Chief Machinist's Mate Kesler, and Machinist Christensen, Left at Newfoundland

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two engines and glided to the water. On the "NC-3" and "NC-1" motors and controls NC worked smoothly, however, and the 540-mile trip to Halifax was completed in about nine hours. The "NC-4" was meanwile unheard from, as its wireless had failed it. But next morning it rode into Chatham, Mass., where it was fitted with two new Liberties, and during the next few days was tuned up once more.

Both commanders and crews became thoroughly acquainted with the equipment during this first lap of the journey. The directional wireless was tested, telephone communication used constantly, navigators became accustomed to picking up the stationary destroyers by their plumes of smoke, while the pilots profited by experience in extremely "bumpy" weather. The only real discomfort was suffered by the commanders, who skinned knuckles and knees while making their awkward tours of inspection along the hull and rigging.

Two cracked propellers being discovered on the morning of May 9, the "NC-1" and "NC-3" were held at Halifax until May 10 while the propellers were replaced, the interval also being used for additional "tuning up."

On the morning of that day they left on the jump to Trepassey Bay, Newfoundland. The "NC-1" rose at 8:49 a. m., rode the 460 miles with ease, and touched water in Trepassey Bay at 4:14 p. m. The "NC-3" was unfortunately compelled to return for a new propeller when just out of Halifax, and was thus unable to reach the shelter of Trepassey Bay until 7:50 p. m. the same evening.

And there, most luckily for the "NC-4," the planes were held by poor weather until the evening of May 15. On that evening they tried to leave the water with too large a cargo of gasoline, and were unsuccessful. In the midst of their attempt the belated "NC-4" appeared. Considering this a good omen, Commander Towers postponed the historic jump-off till the following day.

On May 16, everything was in his favor, boats groomed, weather ideal, and men in the pink of condition. So toward sunset the fateful order was given. At 10:03 p. m. the "NC-3" slipped from the friendly water of Trepassey Bay; at 10:05 p. m. the "NC-4," and at 10:09 the "NC-1."

Soon they met the black night which blotted everything from view except the lights of the other planes, and the regular succession of blazing destroyers which advertised their position 40 miles away with searchlights and bursting star shells.

About midnight appeared the bright May moon in a cloudless sky. And shortly after, the formation loosening, the planes seem to have flown on independently.

Passing over a surprised merchant ship shortly after this, the "NC-4" flew on without trouble until 8:00 a. m. At that hour fog began to slip by in little lumps. At 9:30 it thickened, and at 9:45 was so dense that the sun could not be seen.

## WINGS

By CHARLTON LAWRENCE EDHOLM

THAT a poet is not infrequently a seer also is again evidenced by the verses republished here. These lines appeared in Popular Mechanics Magazine for September, 1909. They were inspired by Bleriot's flight across the English Channel, on July 25 of that year. Subsequent events make them even more appropriate today, while their beauty is imperishable.—Editor.

THE hand of man, emerging from the mist
Of primal ages, was a hairy fist,
All blood-bedabbled; for the hand had killed
Before it learned to sow and reap and build.
So each new tool was but a weapon, fit
To add new terrors to the blow of it:
The first rude ax was formed for bloody deed,
Split skulls before it served the builder's need.
And thus through ages runs the tale; by worst
Of uses is the new-found tool accurst,
Yet we believe what prophet's words record,
That into plowshares men shall beat the sword.

For centuries we stood upon the edge
Of space and yearned, while sparrows from the hedge
Took flight and taunted us. "That I had wings!"
'Mid stormy music, thus the Psalmist sings,
"Then would I fly away and be at rest!"
And lo, the wings are ours, a gift, the best
The genius of our race has forged; a tool
Fit for our eager age. What says the fool,
The War brute? "This is mine, for brawls and strife,
As hawk wings are the hawk's—for taking life!"

Well, claim them, War god! Use them till the race
Will kill for you no more. What narrow space
Holds man today apart from brother man,
A range of rock, a river or a span
Of channel; and our wings shall overleap
These dwarfish landmarks. Then what king shall keep
His folk from merging with humanity
As waters intermingle in the sea?

Sail forth, winged Argonauts of trackless air,
And as upon your homeward course you fare
Bring heav'nly treasure. Neither gold nor steel,
Nor gross and earthy wealth weight your light keel;
Man's brotherhood, bring that as Golden Fleece
On sun-blest wings, bright harbingers of peace.

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But soon after, to the joy of the navigator, the ship was able to rise above the mist and sail on over the fluffy expanse. At 11:27 a rift in the clouds showed a stretch of tidewater below, and two minutes later he was able to show the pilots a rocky coast that proved to be Flores Island, the westernmost of the Azores. Swooping close to the beach, they found destroyer "No. 22," and rose again in an attempt to reach Ponta Delgada, some 300 miles away.

When halfway there, however, the fog closed in again and at approximately 1:00 p. m., May 17, the good ship was brought to the water in a small bay on the Island of Fayal. Locating himself, the commander gave the order to fly on, and at 1:23 p. m. he landed in Horta Bay and brought his plane to rest beside the cruiser "Columbia." He reported that his elapsed time was 15 hr. 18 min., giving him an average speed of 81.7 nautical miles per hour. His plane needing only light repairs, it rested here until the morning of May 20, when it took flight for Ponta Delgada, making the 150 miles in 1 hr. 44 minutes.

Meanwhile the "NC-1" and "NC-3" had fared less fortunately. Traveling not quite as fast as the "NC-4," they were thoroughly trapped in the fog and rain of May 17. The "NC-1" saw its last destroyer, "No. 18," at 11:10 a. m., May 17, after which it lost its course. Two hours later, knowing that he was in the approximate location of the Azores, the commander directed his pilots to halt his ship on the surface of the water. Despite their skill, the choppy sea damaged both lower planes, tore away one pontoon, and smashed an elevator. This was the "NC-1's" deathblow. Calculation showed them to be about 100 miles northwest of Fayal. At 7:20 p. m. a small boat from the steamer "Ionia," on her way to Gibraltar, made a perilous trip to the wrecked plane and brought off the crew. An effort was also made to tow the seaplane to port, but the line parted and it was left to its fate. Later, however, the destroyer "Fairfax" attempted salvage, but was likewise unsuccessful. On the afternoon of May 20, a few miles north of Corvo, the "NC-1" sank from sight.

But the greatest tribulation was reserved for the "NC-3." Trouble started about 1:00 a. m., May 17, when the lights on the instrument board went out. This necessitated a climb above the clouds to enable the navigator to use the stars for reference. And here, it seems, winds of unexpectedly high velocity blew the plane off its course. A parallel path was followed with some success, however, until, between destroyers "17" and "18," the route was lost altogether. At 11:30 in the morning of May 17, Commander Towers decided that a halt should be made to permit more accurate observation. And, like the "NC-1," his plane was so damaged that it could not rise again. Calculations showed his position to be 60 miles southwest of Pico, or about 200 west of Ponta Delgada. Long before, the wireless had broken, diminishing the chance of rescue. And during the evening of the 17th, a vicious gale arose. Continuing during the 18th, it is calculated to have reached a velocity of 90 miles an hour. Although the sturdy hull took the punishment splendidly, the men were forced to take turns at manning the pumps, and were even forced to stand on the wings to preserve the balance. During this day, too, the water supply ran low, and the exhausted crew was forced to drink from the radiators. On the morning of May 19, however, the wind

**The Crumpling of the Frail Undercarriage on This Martinsyde Biplane Wrecked the Machine as It Set Out to Overtake Hawker, on May 18, 1919. Raynham, the Pilot, Had Every Hope of Beating His Competitor as His Plane was Considered Much Speedier, Although the Lowest-Powered of Any in the Race. Morgan, the Navigator, Later Injured in the Crash, is Seen in Conversation with the Rival Sopwith Team**

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and waves subsided and a start was made for Ponta Delgada. Trailing its wings on the water like a crippled bird, it "taxied" steadily eastward till 5:50 p. m., when it drew into the breakwater as crowds cheered and guns fired salvos of welcome. Investigation showed the damage to be so serious that it was disassembled and is now on its way to New York.

Thus did the "NC-3," "NC-1," and "NC-4" make America's bid for transatlantic laurels. With the "NC-3" dismantled and the "NC-1" on the bottom of the sea, the "NC-4" alone carried the hopes of America on its 800-mile jump to Lisbon.

On May 27, ten hours after leaving the Azores, the "NC-4" glided into Lisbon harbor, the first airship of any kind to make the historic journey.

The whole world watched the flight of the American flying boats, but nowhere was interest as keen or appreciative as in Newfoundland. Here was a big Vickers-Vimy bomber and a huge Handley Page, on both of which mechanics were ceaselessly at work. And at their hangars near St. John's, where they had been confined by unfavorable weather for weary weeks, were the Martinsyde team and the rival Sopwith plane. Knowing ones watched Harry G. Hawker, the pilot of the 375-hp. Sopwith, with particular interest. They had heard, and firmly believed, that he had vowed "to beat the Yankees across."

And at noon of May 18, as the American "NC-1" rode in the harbor at Horta—two-thirds of the coveted journey accomplished—Hawker went into consultation with the weather experts. He found that conditions were far from perfect; yet he calmly prepared to make good his word. At 3:00 p. m., local time, the official starter arrived at the Mt. Pearl aerodrome outside of St. John's. And at 3:15 Hawker and Lieutenant Commander Mackenzie Grieve, his navigator, pulled their inflatable rubber suits over their woolen flying clothes. Calmly they climbed into their cramped quarters, gave the word, and at 3:21 rose from the ground.

The little group at the lonely aerodrome saw the plane circle to gain altitude, straighten out, and fly eastward over the city—and over the hangar of the rival Martinsyde, too, where a skeptical crowd had gathered on hearing of Hawker's decision. But the most skeptical knew the race was on, as the dwindling Sopwith sped over the white cliffs of the coast, and the steel undercarriage was seen to fall away. Then—six long days of silence.

Hawker and Grieve were reluctantly mourned as dead by all except the pilot's wife. And on May 25 she was justified, as she learned how the heroic pair had been forced to the water by defective water circulation when 800 miles from Ireland; how they had been picked up by a northbound tramp unequipped with wireless after a wait of 90 minutes, and finally how the grateful British government had dispatched a destroyer to overtake the little steamer and return the airmen to a jubilant nation.

Meanwhile at Quidi Vidi, Raynham conferred with his navigator, Morgan. They had previously decided that their attempt would be made between 5:00 and 6:00 in the evening. But discretion was abandoned as love of the race grew upon them, and at 4:15 they too were ready for the start. Rolling over the bumpy ground at 40 miles an hour, Raynham was on the point of pulling his heavily burdened machine into the air, when the running gear smashed into a crossridge, and threw the machine on its nose, thus eliminating the Martinsyde from all immediate competition.

Finally mention must be made of the unfortunate "C-5," the navy's 192-ft. nonrigid dirigible which blew out to sea on May 15. Its 1,000-mile experimental trip from Montauk Point, New York, to St. John's, was accomplished so satisfactorily, despite heavy fog and unfavorable wind, that hope ran high for a transatlantic trip. It would have been a dangerous undertaking for the little bag, but advantage could probably have been taken of the careful safeguards provided for the three seaplanes. Unluckily, however, no hangar was provided at Quidi Vidi, and on the evening of May 15, the wind blowing from 30 to 40 miles an hour, the land crew of 100 men was able to hold it on the ground with difficulty. Pitching and tossing, stripping its bottom of the canvas covering, the unlucky "blimp" at length became altogether unmanageable. Ordering his companions to leave the ship, the lieutenant in charge tugged at the rip cord, in an endeavor to deflate the bag. At this moment the anchor ropes snapped and the plane bounded up on its wild ride into the darkness. Giving one last unsuccessful jerk at the rope, the plucky lieutenant jumped for his life. The "C-5" has been seen no more.

The Navy's 192-Foot, Nonrigid Dirigible, the "C-5," is Shown on Its Start from Long Island for the 1,000-Mile Trip to Newfoundland. After a Most Successful Run up the Coast, It Spoiled the Navy's Plans for a Transatlantic Dirigible Flight by Ripping from Its Moorings and Driving Out to Sea

This View of the "C-5" Shows the Two Pilots Seated Together in the Bow of the Car, and Also the Two 125-Horsepower Engines Which Drove It at a Speed of 50 Miles an Hour. Its Uneventful Trip to Newfoundland Made Its Participation in the Race Seem Certain



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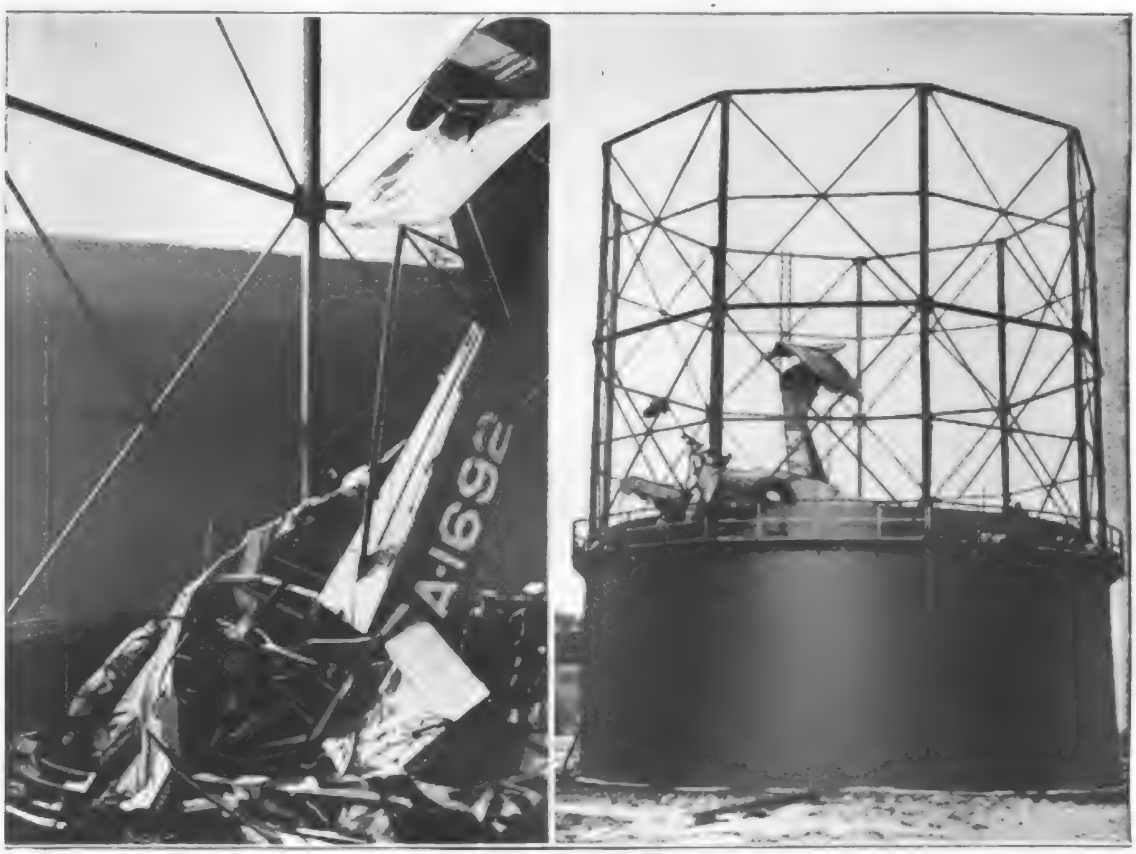


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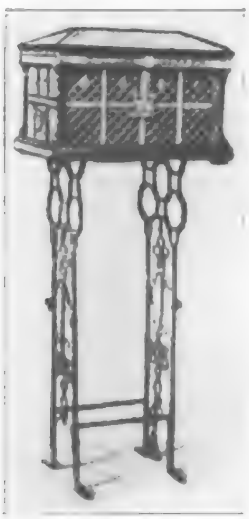
**This Unfortunate Mishap was Witnessed by Scores of Reporters and Navy Officials Gathered to Observe Preparations for the Navy's Transatlantic Flight. While Stunting at a Low Altitude over the Land, the Seaplane Slipped into a Nose Dive and Crashed into This Big Hydrogen Tank. The Picture at the Left Shows How the Big Liberty Motor Crushed Both Pilot and Passenger**

## VENICE GUILDS GIVE COFFER TO NEW YORK CITY

An exhibition and sale of art objects fashioned by Italian craftsmen who had been driven from their homes by the Austrian invasion, recently occurred in New York City. In connection with the exhibition came a graceful courtesy from the guilds of Venice to the city itself in the form of a banner of St. Mark inclosed in a coffer of wrought iron and silver, bearing on top a colored-enamel medallion of the lion of St. Mark, and on the sides the coats of arms of the ancient Venetian cities. The coffer has been given a place of honor in the New York City Hall.



## TWO DIE IN SEAPLANE CRASH AT NAVAL AIR STATION

Just three days before the start of the transatlantic NC seaplanes from Rockaway Naval Air Station, two popular young airmen were killed at that station in view of scores of newspaper correspondents and navy men. The ill-fated plane, of the small HS-1 type, rose from the water at 4:00 p. m., with a crack ensign-pilot at the controls and an enlisted man as passenger. Almost immediately the machine was observed to bank steeply to the left, then to the right. The onlookers commented on the daring of the maneuvers. They were astonished again as the seaplane turned inland, at an altitude of barely 300 ft. Another bank followed, this time almost perpendicular. The plane slipped out of control, lazily spun down in a nose dive, and crashed into the cage-like structure of a half-empty gas tank, just eight minutes after leaving the water. The Liberty motor crushed down upon the two men, mangling and killing them. Fire started, too, but quick work by the spectators saved the bodies.

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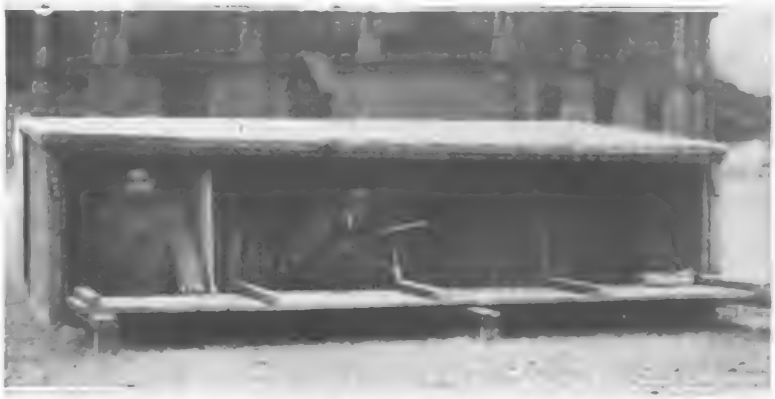
# TELEPHONE-MEGAPHONE INSURES FAIRNESS IN REFEREEING TRAPSHOOTING

Trapshooters have added an electrical device to their layout, for the use of the referee. It is essentially the telephone-megaphone arrangement used for announcing trains at large railroad stations. For trapshooting it is installed with the telephone receiver in the trap house, beside the trap from which the targets are thrown, and the megaphones, for there are two, are located back of the firing line, one at each side of the shooters' platform.



With This Arrangement the Referee Occupies a Compartment of His Own in the Left End of the Trap House, and Reports the Result of Each Shot through the Telephone. He can See the Birds Much Better but cannot See the Shooters at All

Until now the referee has stood back of the shooters; his job is to call the birds "dead" or "lost." There have always been serious objections to this method, for two chief reasons. First, the referee could see the birds no better than the shooters, and consequently his decisions were often questioned, and disagreements were not uncommon, many important matches hinging on the calling of a doubtful "kill." Corollary to this first reason was the second, that the referee always knew who was shooting, which opened the way to favoritism, or, equally bad, charges of it.

By placing the referee nearer the birds —more than 16 yards nearer—he is naturally in a much better position to see what damage the shot actually does to each flying disk, and he is obliged to be absolutely impartial, since he cannot see the persons shooting.

The electrical device was adapted for the use by a New York marksman, and passed its experimental stage during the spring at the Travers Island traps of the New York Athletic Club. Later it was used at the same traps for the Victory Week Shoot, when several important championships, including the Amateur Championship of America, were decided. It was at this time that trapshooters from all sections of the country were given an opportunity to witness the new method of refereeing. Their approval was so general that trapshooting clubs, particularly those which hold large tournaments, are planning to install the equipment without delay. Trapshooting is an all-year sport, and any improvement is particularly valuable.

The Loud-Speaking Telephone Receiver at the Shooters' Platform Gives the Referee's Report of Each Shot without Prejudice or Favor

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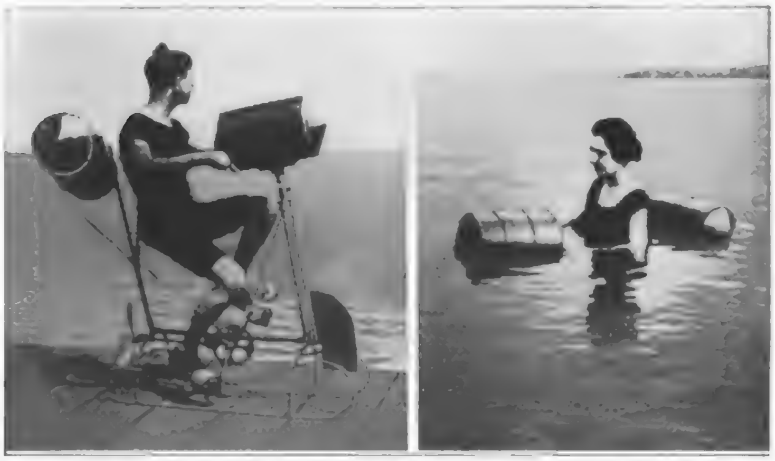
## NEW WATER BICYCLES ADD TO JOY OF BATHERS

A water bicycle that imitates the submarine, in that it operates almost entirely submerged, has appeared in the East in time to contribute a new pleasure to the bathing-beach season. Only the rider's head and shoulders appear above the water, the machine being buoyed up by two air floats, of 8 to 10-gal. capacity, placed breast-high at front and back. The cycle's immunity to rough seas promises usefulness for beach rescue work.



This Submersible Water Bicycle Operates with a Propeller and Steers with a Front Rudder, as Seen at the Left. The Air Tanks Keep Machine and Rider Afloat, as the Right-Hand Picture Illustrates

An English floating bicycle has also just made its appearance. Primarily a land vehicle, it owes its seaworthiness to a boatlike pontoon at each side.

Mounted on this amphibious contrivance, the rider is able to run from the beach into the sea, and back again, or to ford a stream, at his pleasure.

PHOTOS BY GILLIAMS SERVICE

This English Bicycle Rides Like Any Other on Land, as the Left View Indicates. The Right Picture Shows How the Pontoons at the Sides Float the Machine in Water

## WEALTH OF GOLD IN SIBERIA; MINERALS OF ALL KINDS

An inscrutable dispensation seems to have placed the greatest mineral wealth in those lands least able to develop it. Siberia is a case in point. The eastern half of that vast domain is exceedingly rich in mineral deposits, which run the gamut from gold, silver, and precious stones to graphite and salt. In the Ussuri region, north of Vladivostok, gold is found everywhere, and only lack of enterprise and facilities prevents extensive development. There is, indeed, more or less gold in practically every Siberian province, though much of it is in deposits of low content. In the steppes considerable silver is found, though by no means confined to that region. Good iron is quite widespread. Coal also is abundant, some of it excellent in quality. The Altai Mountains are rich in copper, as is the Kirghiz steppe; and in other localities a rather low content is compensated by proximity to coal. Most of the metals, rare or common, occur at one point or another, as well as various valuable chemicals, oil, mica, asbestos, and graphite. Though diamonds are rare and of small size, other precious and semiprecious stones, and some varieties of marble, are found in workable quantities. Present workings are insignificant compared with the supply.

## MAKE BIG GUN BY SHRINKING LINER INTO PLACE

In making a 12-in. gun at an eastern arsenal, the liner tube, 36 ft. long, was finished and rifled before being shrunk into place. Customarily the liner is fine-bored and rifled after the shrinking operation, and this is declared to be the first time a gun of such large size was ever assembled after the tube was finished.

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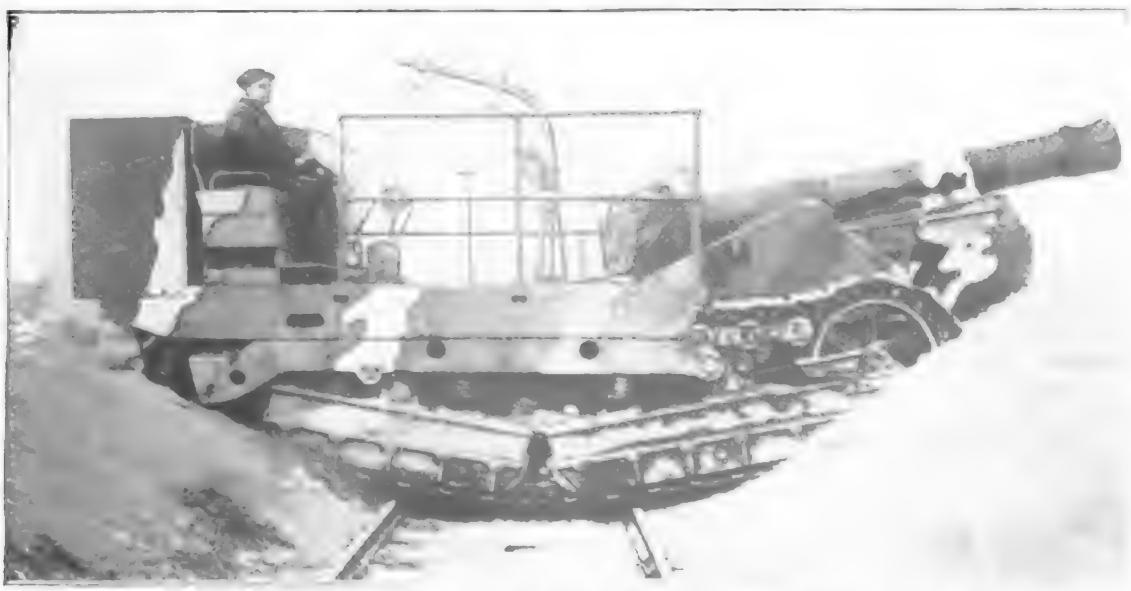
# ENDLESS-TREAD TRACTORS MOUNT HEAVY GUNS

This Eight-Inch Howitzer is Mounted Directly on a Self-Propelling Base, and is Thus Easily Moved to the Battery Position and Quickly Aimed in the Direction of the Enemy. It Is Another Indication of the Growing Use of the Gasoline Engine in Every Branch of the Artillery Organization

No phase of the development in artillery practice during the war has been more marked than the substitution of the gasoline engine for the horse in almost every conceivable way. A single truck or tractor now pulls the big rifle, or howitzer, displacing three or four teams of horses; huge supply trucks supplant commissary wagons and ammunition caissons; mobile repair shops roll their way almost into the front lines. And one of the latest advances in this motorizing process is represented in the illustration. Heavy guns are mounted directly on self-propelled platforms which climb a 40° grade easily, travel 12 miles an hour on the level, and can go into action the instant they arrive at the battery position. The mounting also facilitates aiming to the right or left, relieving the gun crew of this heavy duty.



The Self-Propelling Howitzer is Shown Here in Firing Position. A Mounting of This Sort Increases Tremendously the Mobility of These Big Weapons, in Addition to Making Them Easy to Operate. Ammunition and Supplies may Easily be Transported on the Same Carriage

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## COAST-CITY POLICE COLLECT GAMBLING-HOUSE DOORS

As a hobby, collecting takes many forms, but the greatest collection on earth, presumably, of gambling-house doors was recently acquired in the line of duty by the Portland, Ore., police. The locks and buzzer signals of the Chinese quarter were made illegal by ordinance of the city council, and in enforcing the order the police frequently have to take the doors and sometimes the frames as well. Most of the doors are extremely strong and heavy. The department now has over a hundred of them. All doors collected in raids were held as evidence against the places raided.

Part of the Notable Collection of Doors Taken by the Police from Chinese Gambling Houses in Portland, Oregon: Note the Heavy Hinges and Locks and the Solid Construction of These Bars to Law and Order

## ARMY AIR SERVICE SUGGESTS CONTRACTS FOR 500 PLANES

The army air-service authorities have offered to the Secretary of War a plan which involves the purchase of at least 500 airplanes from American manufacturers. As there is no immediate need for the planes, the purpose is simply to stimulate the airplane industry and prevent a slacking of interest and efficiency. Coupled with this plan go the names of seven types of planes approved as representative of the most modern developments in the science of airplane construction. They are the Le Père observation plane, the Loening monoplane, the Thomas Morse scout, the U. S. D9-A day bomber, the Vought training plane, the Martin day bomber, and the ordnance-engineering pursuit plane.

## ANTISEPTIC VAPORS SPRAYED ON INFECTED WOUNDS

The time required to clean up a bad wound by irrigating it with an antiseptic fluid is stated to be about 10 days. But with a new method the time is reported to be cut to two days, and even 24 hours, and in addition the patient is spared the discomfort of lying in a bed, continually saturated with the antiseptic fluid. This new method cleanses the wound by "spraying" it with a current of gas with which is mixed some antiseptic vapor. In administering the treatment, air is pumped into a flask which contains a mixture of ether and some volatile antiseptic. Emerging thoroughly medicated from the flask, the air passes through a rubber hose and down an aseptic tube to the heart of the wound, where it penetrates to every portion of the affected area. By maintaining this action continuously for 48 hours, it has been possible to conquer the most stubborn cases of infection.

## CHINATOWN HAS OWN MOVIES FOR COMMUNITY WORK

Motion pictures, in which not only the subjects but the titles and reading inserts are Chinese, are now used for community work in New York's Chinatown, and similar settlements in other communities. English translations appear on all leaders, however, the object being to assist in teaching American standards to the aliens from the Flowery Kingdom. The series of such films now in process of preparation will also be distributed in China.

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# COMMENT AND REVIEW

[These pages were printed May 26, 1919]

ONE of the things which this country will bring out of the war is an increased interest in securities by people who never before considered such investment. The small investor formerly thought of bonds and stocks only in terms of thousands, wholly beyond his reach, and as entirely belonging to banks and men of wealth. The war-savings stamps, and the government bonds of $50 denomination up, have not only encouraged thrift, but have opened the eyes of the multitude to the fact that to be a bond owner does not require a king's ransom. Now we have some 20 million bondholders, and where formerly only 1 person in 7 was thrifty, now 5 out of every 7 are savers. We do not measure up to the stern thriftiness of the French, who, by extreme economy, paid off the war indemnity which the Franco-Prussian war occasioned, in an incredibly short time. But proportionately we have made a good start, for we have from the beginning been a nation of wholesale wasters because our resources of every kind were so enormous. Some were even ashamed to save and thought it smart to spend lavishly as fast as they earned. This condition permeated the entire land. We may well take genuine pride in a good start on the road to sound common sense and thrift. The very act of saving increases self-respect. The flowery speeches of a thousand orators in more than a century are forgotten, while these words of wisdom by Benjamin Franklin live on:

*War Taught Saving Habit*

> "Save a little of thy income, and thy hide-bound pocket will soon begin to thrive and thou wilt never cry again with an empty stomach; neither will creditors insult thee, nor want oppress, nor hunger bite, nor will nakedness freeze thee. The whole hemisphere will shine brighter, and pleasure spring up in every corner of thy heart.
>
> "Remember that money is of a prolific, generating nature. Money can beget money, and its offspring can beget more, and so on. Five shillings turned is six, turned again it is seven and threepence, and so on till it becomes one hundred pounds."

Time was when good bonds were issued chiefly in denominations of $1,000, with an occasional small proportion of $500 units. To the beginner, the time required to save enough to buy one bond was so long, he was discouraged in even making the attempt. Now excellent securities of all kinds can be had in $100 units, which increases the number of possible buyers by thousands. Once more the frequent caution: Before buying, or exchanging, be sure to consult a good banker and so avoid losses.

SINCE our previous issue there has passed away a business man of world-wide reputation, whose monument is the highest and most notable business building in the world, and whose success was built on the greatness of small things. The profits on articles of merchandise, which retailed at 5 and 10 cents each, in a thousand stores, accomplished all this. It furnishes one of the most impressive examples of what thrift and industry and square dealing, consistently applied, can accomplish.

*Greatness of Small Things*

Woolworth began in a very humble way, as a small merchant in a country town. He conceived an idea, and all his life confined himself religiously to that one effort. Even when he had acquired a vast fortune, when most men under similar circumstances are tempted to, and usually do, branch out in lines unfamiliar to them, he held himself steadfastly to his one idea. It is true he expanded, but it was always along the one line. That he possessed a natural ability to accomplish what he did, is obviously true, and it is not given to all of us to measure up to his success; yet is it equally true that many another man has possessed the same talent as he, who has failed to exert the same industry and steadfastness of purpose, and has consequently never been heard of. Nor did he possess the same ability during the first few years, that marked the last 10 years of his life. The germ was there, but it was cultivated and nourished, and each year brought additional experience and strength.

We cannot all be Woolworths, but the least of us can profit by his example, and so add to some extent to our usefulness and worth in the world. When he started out he never dreamed of the high pinnacle in business or vast wealth he eventually attained. His mind and effort were wholly concerned in doing a

thing which was worth while, just the best he could. Riches and fame resulted, and both are naturally a gratification and pride to any man. To the young man with little or no capital except a high standard of business morals and an indefatigable purpose to succeed, his success furnishes a brilliant example.

**The Russian Experiment**

THE experiment of national rule under the Bolshevistic plan is not without its good purpose in the end, though horrible in the extreme to its immediate victims, and disastrous to the country. The tyranny of czars, especially during the past 20 years, was mild and childlike compared with the present unbridled use of power in the hands of the ignorant and unrestrained. It will burn itself out in time, and sober-minded, intelligent minds must ultimately take up the task of bringing order and security out of the present chaos. One awful principle alone, that of making women the property of the state and thereby the slaves of many men, spells ultimate failure to the system. Even the cavemen, of thousands of years ago, had a better, higher standard of morals. That any "ism" could claim any possible progress in so going back to pre-savage days is both monstrous and inconceivable. As it stands now, the male head of every family is subject to severe penalties, who fails to report and surrender to the local authorities every female member of his family between the ages of 17 and 32.

And yet there are in this country women of social standing and wealth who from public platforms defend and favor Bolshevism and the I. W. W., which means practically the same thing. Such men and women are a menace equally to every family in the land, from the poorest to the richest, and deserve to be confined in asylums for the insane.

In this connection it is disheartening to note to what extent, on technical grounds, many I. W. W.'s, who were fairly tried and properly sentenced by Judge Landis only a few weeks ago, are already coming out of prison; and that those who were ordered deported long ago, are still in this country. The most of us seem to have the backbone of a caterpillar, so far as exerting any effective public sentiment to combat these things. The I. W. W.'s having nothing else to do, spend all their time organizing and in propaganda; but are the things, however worth while, which occupy our time, really any more so than to combat this menace? When occurs a flood, a cyclone, a fire, a pest of smallpox or flu, then everyone gets busy and applies the proper remedies: we do things. But with the I. W. W. and similar dangers, we merely talk mildly, or not at all.

To return to Russia. Lenine's latest is an additional demonstration of what he doesn't know. He has announced that money, that token of exchange which goes back thousands of years in all countries, is a prime cause of trouble; therefore, he would abolish it. As one means, he runs the government printing presses night and day, turning out tons of rubles. These rubles, which under a former government were worth 50 cents of our money, are rapidly reaching a point where they may best be quoted at so much per pound, or ton.

Instead of money, Lenine would make a direct exchange of labor the commodity; in other words, return to barter. For instance, he who wanted sausage could shovel off the snow on the butcher's walk; just what happens to the second and third buyer who wants sausage when there are no more walks left to clean, is not explained, nor what in southern Russia where they have little or no snow.

Of course this method has the advantage of doing away with exchange between places more than a few miles apart, for how could a man in Chicago, wanting something in New York, clean a sidewalk or mop a floor, or whitewash a ceiling 1,000 miles away? However, Lenine hopes to simplify these difficulties by establishing government local stores, where all the people of the surrounding district will be credited with their day's work for the government, and where they can draw supplies to the amount of their credit earned. With only one store at which to trade, much lost motion is saved, and "shopping" as known to us would speedily become a lost art. Also, with only one store, all competition is removed, and if the buyer fails to like the goods or treatment he receives, all he has to do is to stop buying and go without. It's a beautiful scheme in a way, because it's so simple, and automatically does away with all banks and other present machinery for saving, for nobody owns anything to speak of, beyond the clothes he wears and a little house furniture. As the government would own all lands and industries, there would be nothing to leave to one's family, which would save a lot of trouble over wills and dispense entirely with litigation.

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And these are just a suggestion of the things Bolshevists would have us adopt in place of our present laws and individual ownership; and the I. W. W.'s are like unto them.

If anybody in this country feels their happiness depends on having these and similar conditions, they should lose no time in getting into the Bolshevist band wagon and emigrating to such parts of Russia as are endeavoring to establish these "reforms." As for the rest of us, who are overwhelmingly the most of us, we won't stand for it.

IT was most fitting that the day appointed for delivering the treaty of peace to Germany should be the anniversary of the sinking of the "Lusitania." But what a contrast in conditions! When that ship went down, Germany was at the apex of her military strength, and her women and children paraded with bands and banners to celebrate the death of other women and children. The vast military machine throbbed with exultant power. Only 48 months later the gigantic engine of destruction itself lay shattered, its leader a fugitive to the sanctuary of a neutral country, previously too insignificant to notice.

***After Many Days***

Not until the allies had determined fully, was the vanquished told to send its delegation upon a certain day. While the German delegation entered, the assemblage, including the great men of many nations, stood upon its feet. When the time came for the German delegation to reply, its spokesman, Count von Brockdorff-Rantzau, and his associates studiously insulted the body by remaining seated while delivering his reply. The incident, by reason of its extreme crudity—like a small child who makes faces at another—becomes ludicrous, but emphasizes and calls to all the world to witness the boorish character of a Hun, which around the peace table, as elsewhere, is out of step with all the world. The American Indians, skilled as they were in hair lifting, and terrible in warfare, never so far forgot themselves as to fail to rise when addressing their enemies at a peace council.

If the Huns have hopes of earning a seat in the family of nations, they will have to reverse their lifelong attitude, and instead of estimating the world with a German yardstick, will have to take an inventory of themselves as regarded by the world.

WHEN a bill, increased daily, is allowed to remain unpaid for four years, it naturally assumes large proportions. The Huns went on a big military spree and, while shooting up Belgian and French towns was rare sport for a while, there must come an end to all revels. The Huns are now going through the sobering-up process with the usual next-day sensations, and a conviction that everybody else was to blame. There is no sentiment about the judge, however, who declares the broken glass and furniture must be paid for, and bonds given to keep the peace. Meanwhile the disturber of the peace is not allowed to carry dangerous weapons.

***Peace Terms Fair***

Those papers in this country which were pro-Hun all through the war are using plenty of big headlines on front pages to assure us the Huns will never sign. They will have signed long before these pages can reach our readers, and incidentally the vanquished can thank their lucky stars they are getting off so easily. In view of the fact that the Huns planned and began the war; of the barbarous means to which they resorted; and finally of the terms of settlement which they offered the allies in July, 1918, just before their final, fatal drive—in view of all this, they are getting off lightly. For much which they did, no punishment nor repentance can ever atone, nor indemnity repay.

Crude bluffers and insincere to the last moment, the Hun leaders made their people believe that the armistice and the peace terms, virtually accepted in advance, were at least as favorable to Germany as to the allies. Hence there were signs of neither repentance nor regret at the outcome. When the evil day could be no longer deferred, and with publication of the terms laid down by the allies, there instantly goes up a wail from all the nation; social functions, gaming, theaters, sports, all of which went over the top with the signing of the armistice, now suddenly cease, and the land goes into mourning at its "terrible fate."

The fate is in no sense "terrible," as the Hun arrogantly interpreted that word to the world, but it is severe and just. With four million of her best pro-

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ductive men dead in the war; her navy and army reduced to a skeleton of their former greatness; her colonies and export trade gone; and worst of all, her true nature bared to all the world, Germany has a long, uphill road to travel. The national debt is $1,000 per man, woman, and child, of which 25 billion dollars is due as indemnities and 45 billion represent her own war debt. Inasmuch as the indemnity must be paid first, it is doubtful if the German war bonds are ever restored to any substantial value. It will be during the long period of heavy taxation that the German people will come to appreciate their crime of 1914.

As for the former war lord, he should be exiled for life, which for him will be a far worse fate than execution; and those other high offenders should receive the punishment of execution generally adjudged murderers.

## *The Human Albatross*

THE two world events of the past month have been the delivery of the peace terms by the allies and the effort at transatlantic flight. While the signing of peace terms on a right basis is of far greater moment, the flight, by reason of its unknown as well as contemplated dangers, has stirred the red blood of nations the world around. This, too, was accentuated by reason of the rivalry between our own three fliers, and the competition between two nations.

Our own effort can be said to have been made under very fair conditions of success, with picked men from our Navy, after an initial over-sea try-out of 1,000 miles, and the perfectly worked-out assistance of destroyers spaced every 50 miles along the proposed route. That all three of our planes succeeded in making the long stretch between this continent and the Azores, the longest over-sea flight ever accomplished, is highly gratifying. If the NC-4 lands in Portugal, as at this writing seems probable, the ice may fairly be said to have been broken and the trail blazed. The full details of the log of the NC-4 will write the first chapter in the history of a great accomplishment.

When the first trial of the steam locomotive, the steamboat, the submarine cable, the telephone, and wireless were made, the public of their day, including many learned men, united in an expectation of failure. While the dangers and obstacles of the ocean flight were realized and considered, there was a general hopefulness that the effort would succeed, for we had several years' history of sustained flights overland, while in the other experiments named they were the initial efforts.

The success of our own planes was saddened by the apparent loss of that fearless airnat, Harry Hawker, and his equally brave navigator, Mackenzie Grieve, whose courage stands out as one of the most daring efforts ever made by man. They deserved success, and the world is overjoyed that they live, possibly to try again. Hawker's anxiety that his country should achieve the lasting honor of the first unbroken flight led him to undertake the venture under such adverse conditions of weather as to make defeat seem almost inevitable. He voluntarily gave up an income of $100,000 a year, and put his loyalty to his native country before his duty to wife and child, but he carved his name among the highest in that noble company of Englishmen who for centuries have faced death with composure and a smile.

When the log is completed, I fancy ocean flight will reveal more and greater difficulties than the average layman anticipated and about what the best minds in aviation expected. Experts, of course, hoped that the trial would show the flight not to include as many contingencies as feared. It may fairly be said the difficulties, while of course not insurmountable, are sufficient, and sufficiently established, to demonstrate that regular passenger service is still a long way ahead. The weaknesses may be worked out in two or three years, which would be an amazingly short time, but the probabilities would not seem to warrant any immediate hope of regular service. Only those who have crossed the ocean can grasp the magnitude of the mechanical requirements. The final ocean plane will probably show as marked a difference from the best planes of today as an ocean steamship differs from a river steamboat of the best class. The transatlantic plane will surely come to pass, but the builders realize a lot of hard work lies between that day and this.

For the present, then, let us all rejoice in that permissible and modest pride which Commander Towers and his brave associates have so grandly won for us.

H. H. WINDSOR

These Views Show How the Cut in the Old Sea Wall was Remodeled to Keep Out the High Tide. Instead of Walking Directly from the Sidewalk to the Beach, One Now Ascends the Small Flight of Steps at the Right before Descending. This Adaptation of the Old-Fashioned Stile Adds Three Feet to the Effective Height of the Barrier

## OLD-FASHIONED STILES GIVE ACCESS TO OCEAN BEACH

To give access to the beach below, the sea wall of a coast city was once cut in many places and provided with steps to the lower level. Unfortunately, the ocean seemed to consider this an invitation, and at high tide would frequently rush through these gaps, flooding cellars right and left. Lately, however, some one seems to have recalled the old-fashioned country stile, as concrete stiles have been constructed to maintain a barrier of unbroken height to the waves. It was also considered desirable to present as flat a surface as possible to the sea, so the steps from the beach are interrupted by a landing inside the wall, from which a second flight rises at right angles to the first.

## PHONOGRAPH IS TUCKED AWAY IN CASE OF PLAYER PIANO

An unusual musical instrument now on the market combines the phonograph with the player piano. Only a slight change from the usual construction of the piano is necessary, as the phonograph is placed to the left of the "spool box," in space that ordinarily goes to waste. In operation, the left-hand panel of the case is swung down to reveal the turntable, set just enough out of vertical to hold the record firmly in place, with the tone arm counterbalanced to permit tracking in this odd position. As an incidental merit for the novel arrangement, it is claimed that the tone arm does not bear heavily on the record in this way, but runs lightly and smoothly along the grooves. From the arm, the sound waves are led through the horn to the amplifying chamber in the spool box. The cranking handle is placed on the upper right-hand side of the case. It will be observed that the unusual construction is made possible by the strictest regard for economy of space.

The Phonograph is Shown in the Upper Left-Hand Corner of the Player-Piano Case. The Turntable is Fixed Slightly Out of Vertical So That the Record will Not Fall Off. The Tone Arm is Counterbalanced, and the Sound is Led through the Horn to the Amplifying Chamber in the Center, above the Spool

## AERIAL SIGHT-SEEING BUSSES FLY OVER WESTERN CANONS

To view the scenic wonders of the West from the air, escaping the rough trails and rocky barriers that often screen the rarest vistas—that is the prospect offered to tourists who make Salt Lake City their "going-in" point for sight-seeing trips. Five specially designed airplanes have been prepared for the work of carrying travelers to, and over, the beauty spots of the region, some hitherto inaccessible.

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## FALSE SIDES OF SHIP FORM HUGE LIFE-SAVING RAFTS

Emergency launching of lifeboats and rafts from a ship in distress is frequently attended by confusion of serious consequence. In an effort to give absolute safety and precision to the operation of removing passengers and crew, a Chicago inventor provides enormous life rafts which normally form false sides of the ship. Each raft, of hollow, air-tight construction, may be as long as the straight portion of the vessel's sides. Socket lugs on the ship hold the lower edge of the raft below the water line, and cables bind the upper edge to the deck side. Loosing these cables allows the whole raft to fall outward to the water's surface, its buoyancy releasing it from the lower lugs. When it is afloat, hinged side walls are raised and locked in position, and the passengers transferred by means of ladders or chutes. Portholes, corresponding to those in the ship, penetrate the body of the raft, but are closed by slides after launching. Whether wood or metal is used in the construction, the body is divided by interior partitions into compartments, and provision is made for including in these one or more driving motors, a complete wireless set, and various supplies. Another feature is the storage of a supply of life-saving suits, equipped with rings whereby helpless persons can be lowered from the ship. Rafts of great length may be articulated.

## TREES AS WIRELESS ANTENNÆ SERVED ARMY WELL IN WAR

How radio messages from European transmitting stations, and from ships at sea, were received by the U. S. Signal Corps by using the leaves and branches of trees as antennæ, has just been received. With this natural network, not only was reliable receiving accomplished, but transmission over short distances was successfully achieved. The only preparation made was to hang an insulated wire from a spike driven into the tree near the top, and to spread below a small wire net, the radio equipment being connected to these terminals. With nature thus assisting, the signal corps was able to establish a complete chain of these impromptu radio stations at the battle front, and their extreme convenience and invisibility gave them a peculiar value for army work.

## MANY USES OF ZINC SHOWN IN BIG NEW BUILDING

To demonstrate the structural value of the metal, an eastern concern dealing in zinc has put that commodity to remarkable uses in the construction and decoration of its big new building in New York City. Flashing, gutters, and all other outside work are of rolled zinc. Entrance and vestibule doors are sheet zinc rolled on wood, while knobs and locks are of zinc plate, and hinges are of zinc composition. Elevator walls, grilles, lighting fixtures and ornaments, low-tension electrical equipment, all are of this easily worked, noncorrosive metal. This

**Building Erected in New York City for a Zinc Concern, in Which Practically All Exposed Metal Work, Inside and Out, Is of Zinc, Demonstrating the Value of the Metal for Such Purposes**

feature extends even to the desk and office fittings, and to the constituents of paints and enamels used.

¶ The superintendent of a South African diamond mine is using the X-ray to locate stones secreted on, or in, the persons of the native workmen. As each man passes before the powerful machine, the examiner looks through his fluoroscope, swinging it rapidly up and down, taking in the entire body in a few seconds.

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## ONE-ARMED SOLDIER OPERATES MOTION-PICTURE MACHINE

That the loss of the right arm below the elbow is no handicap in operating a motion-picture machine is demonstrated

**Loss of His Right Forearm does Not Keep This Soldier from Operating a Motion-Picture Machine**

by a crippled soldier at a hospital in Washington, D. C. The machine is motor-driven, but the operator, with an artificial forearm, finds no difficulty in threading the film and making all adjustments.

## CHARGING FACILITIES PERMIT TOURING IN ELECTRICS NOW

Owners of electric autos in New York City are now able to take trips as far as Boston, Atlantic City, Philadelphia, and Washington, and return, without the haunting fear of running short of "juice." A complete system of battery-charging stations has been established along these routes at intervals which take full account of the limitations of electrics as to miles per charge. For the benefit of electric-vehicle operators, booklets have been prepared, giving the locations of these facilities and additional useful information.

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## NEWFOUNDLAND'S CAPITAL CITY IS CODFISH HEADQUARTERS

The capital city of the Island of Newfoundland, St. John's, is the world's greatest codfish market. On the famous Newfoundland banks, which extend for about 300 miles southeast of the island, more than 200,000,000 lb. of cod are taken annually. Much of the catch is dried, and warehouse roofs covered with fish exposed for that purpose are a common sight. Cod-liver oil is an important by-product.

**This View was Taken on the Roof of One of the Great Fisheries Warehouses of the City of St. John's, Newfoundland, and Illustrates the Manner in Which the Greater Part of the Codfish Catch is Dried Before It is Packed for Shipment**

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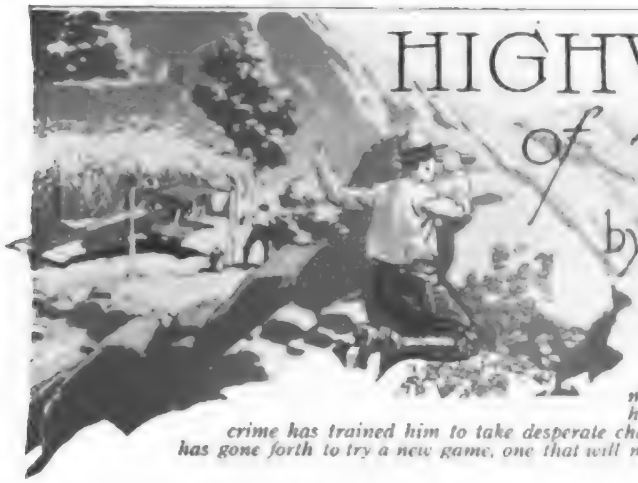
# HIGHWAYMEN of THE AIR

by Lloyd D. Lewis



*"Toward dusk a tiny plane rises out of a mountain retreat far below. . . . In its single seat is hidden a begoggled, helmeted pilot. His whole career of crime has trained him to take desperate chances, and now in one of the fastest pursuit planes he has gone forth to try a new game, one that will meet the demands of his adventurous, reckless nature."*

GREAT BRITAIN is not a visionary, imaginative nation. In fact it is, in the prevalent opinion of the public, stolid; and yet its government has foreseen, and taken measures to forestall, the most fantastic and romantic criminal of all time—the highwayman of the air.

Unadjusted to the new world which the war made, one would be inclined as yet to consider an aerial robber as a fictitious character. The Civil Aerial Transport Committee of Great Britain does not. It regards such an eventuality as certain, and, on its recommendation, England has organized a strong airplane police force. This commitee knows that, along with giant passenger and freight airplanes and airships, will come aerial highwaymen—"knights of the road"—in greater numbers even than when Dick Turpin and his gallant masked horde enlivened the post roads of merrie England by nightly pillage of fat travelers.

Unless the world in general equips its law-enforcing bodies with the fastest airplanes and the most courageous air policemen, the influx of transcontinental "Pullman" planes will begin an era of the most picturesque crime ever known. It is not difficult to see why.

There are on the market today single-seated, high-speed airplanes that can easily make 165 miles an hour, and there is no technical expert who is not confident that a speed of 200 miles per hour will soon be attained by such light machines. These will be the vehicles of the highwaymen, for from them no passenger nor freight plane may hope to escape. Machines large enough to carry 30 or more passengers and several tons of freight have been flown, and more are being constructed. Their maximum speed under present conditions cannot exceed 100 miles per hour. Science will undoubtedly increase their speed, but when it does it will increase the speed of the smaller machine in a like ratio, for the same laws apply to both, allowing a certain rate of speed per weight, power, and resistance to the wind.

Consider the situation as it impends: The "London and Calcutta Express" rolls out of its station, rises slowly and flies eastward across Europe. It is equipped with four great engines, any two of which are capable of maintaining it at a 60-mile speed. It stands, when at rest, 15 ft. from the ground and from tip to tip it is over 100 ft. long. Within its fuselage 30 passengers are resting in club chairs, the men clustered in the smoking compartment near the rear, the women sight-seeing through the observation windows in front. In a kitchenette, porters and cooks prepare luncheon. When night comes, berths will come down from the ceiling and out of the walls.

Above the fuselage, in a glass-inclosed "wheel room," sit the pilots, mechanicians, and navigators.

In the baggage room are packages of precious freight—consignments of currency, registered mail, jewels, costly feathers, silks, all classes of valuable freight that merchants, bankers, and wealthy traders are at this moment sending to other cities on airplane transports. Speed is important in heavily financed trade, and dispatch is the chief value of aerial commerce. The passengers are rich persons, able to pay the high tax of aerial travel.

Toward dusk a tiny plane rises out of a mountain retreat far below. It is no more than 25 ft. wide, 8 ft. in height, weighs only a ton, and its fuselage is but 19 ft. long. With its one engine it travels 165 miles in an hour and climbs 10,000 ft. in a few minutes. In its single seat is hidden a begoggled, helmeted pilot. His whole career of crime has trained him to take desperate chances, and now in one of the fastest pursuit planes he has gone



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forth to try a new game, one that will meet the demands of his adventurous, reckless nature.

In a few minutes he has risen to the 10,000-ft. altitude of the great express plane. He circles once around it and sends a volley of machine-gun bullets through its wings. Flirting close to the pilot's cabin he motions downward, or, if he has taken time to so equip himself, he speaks through the aerial telephone at his side, to the driver of the victim machine, ordering him to descend.

What can the pilot of the big plane do? He may decide to fight, but he knows the hopelessness of such a course, for the faster, nimbler machine can riddle him from any position, escaping return fire through superior power of "stunting." What chance has he to loop the loop or nose-dive with his bulky machine, and with 30 passengers within? He may summon aid through the wireless, but it will come too late in this mountainous, deserted region. He must needs surrender and glide down to the spot designated by his captor.

They land, and the highwayman, covering the occupants with his machine gun or his revolver, may force them to stand in the traditional manner, hands up, while he rifles them of purses and jewelry. Then he may keep them lined up while he goes through the registered mail and the freight, taking what is of value to him. Or the highwayman may, before landing, force the captured machine to accompany him to a retreat where his accomplices await, and the pillage then may be done at leisure.

It sounds fantastic, but what item of this prospectus can be refuted? Certainly, the days of transcontinental travel are here. Passenger lines are now in operation between London and Paris, traveling on regular schedule, exactly as the mail service between New York and Washington operates through the air. London, Paris, Berlin are excited over the incorporation of huge companies for passenger and freight service, and solid plans are being laid by shrewd capitalists. Germany is operating two regular mail lines.

British planes have flown twice to India via Egypt and returned.

The cost is high but not prohibitive, being figured, according to the latest estimates, at about 63 cents a mile. This includes gasoline

*"Against such behemoths of the skies our highwayman, working singly, would have small chance air craft and stranding il on some*

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oil, pilot's salary, mechanics' wages, overhead charges, interest on investment, and depreciation, and is for flights under 300 miles. The fare from London to Calcutta, or from Boston to Panama, for instance, could, it is estimated, be brought down to approximately 50 cents per mile, due to the economies of longer flights. Passage will be open to the wealthy and to persons to whom time means much. Money, important documents, and especially large shipments of stocks and bonds, will be transported in these flying ships in vast quantities—and all are tempting to the highwayman.

To those who may yet doubt, if such there be, it is well to quote the great Italian aerial inventor, Caproni, who says: "The day is almost here when the sky will be plowed with majestic trans-aerial liners carrying a hundred or more passengers, with sleeping cabins, dining and reading rooms, and all other desirable arrangements that go to make a long journey pleasant. Such airplanes will be of enormous dimensions and as safe and stable as the largest transatlantic liner. At present machines are built capable of carrying a score of passengers in a closed cabin. Those large air liners will be especially used for intercontinental flights. To them neither bad weather nor contrary winds will be obstacles."

The airship of the Zeppelin type will also be used on long journeys, it is believed. At present the best of them, British gas bags, have stayed up nine days and traveled at the rate of 80 miles an hour. A noted English aerial authority, and a conservative business man, states that airships of 10,000,000-cu.-ft. capacity, capable of flying 5,000 miles, of carrying 2,000 passengers or 150 tons of freight, could fly from England to America in 40 hours and make a profit of $150 on each of the passengers. The initial cost of such a leviathan of the air would be over $1,000,000, he states.

Against such behemoths of the skies, as prophesied by these two authorities, our highwayman, working singly, would have small chance of success, although he might be able to bring a dirigible down in flames with explosive bullets. What, however, is to prevent a fleet of robber planes from overtaking such an air craft and stranding it on some deserted coast or island? Morgan, the buccaneer, lived before his time.

The democracies of the world, it is safe to say, will provide ample means of protection against such catastrophes. Police planes, much on the order of those now in operation in Great Britain against smugglers and fugitives from justice, will be provided for use all over the world, and we shall see the day when the air is as fully patrolled by silver stars of authority as are the streets of our cities now, where the law-enforcing policeman takes his methodical way.

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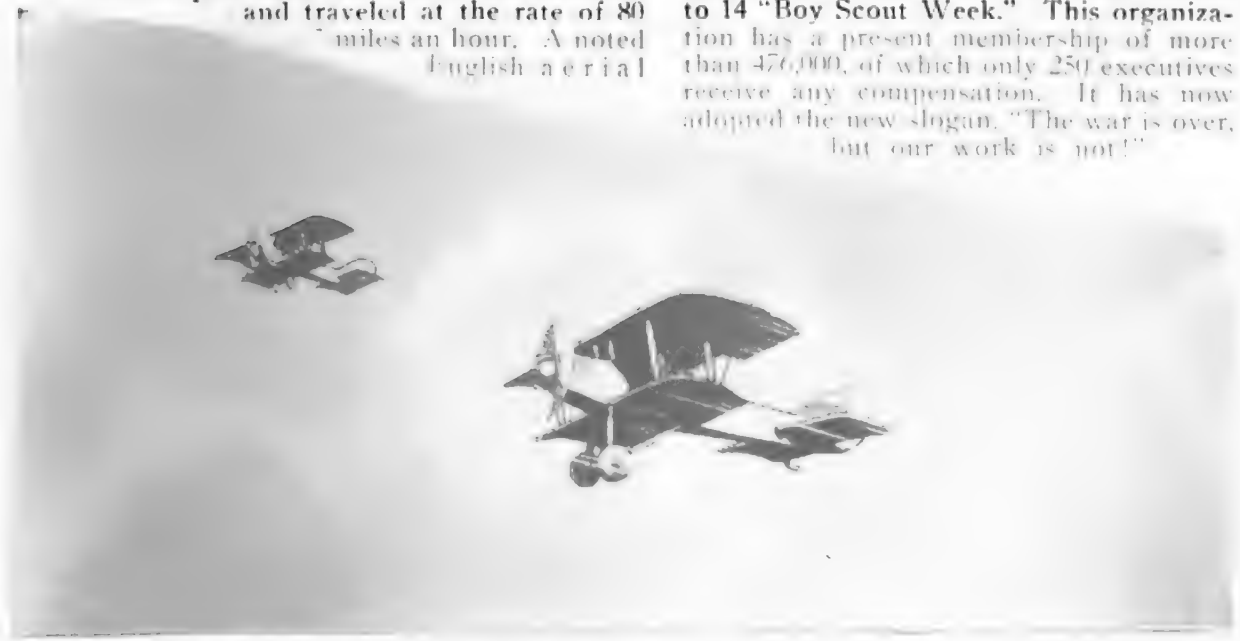
¶ The Boy Scouts of America are setting out upon a campaign for a million associate members, the drive opening with a presidential proclamation making June 8 to 14 "Boy Scout Week." This organization has a present membership of more than 476,000, of which only 250 executives receive any compensation. It has now adopted the new slogan, "The war is over, but our work is not!"



*of success. . . . What, however, is to prevent a fleet of robber planes from overtaking such an deserted coast or island?"*

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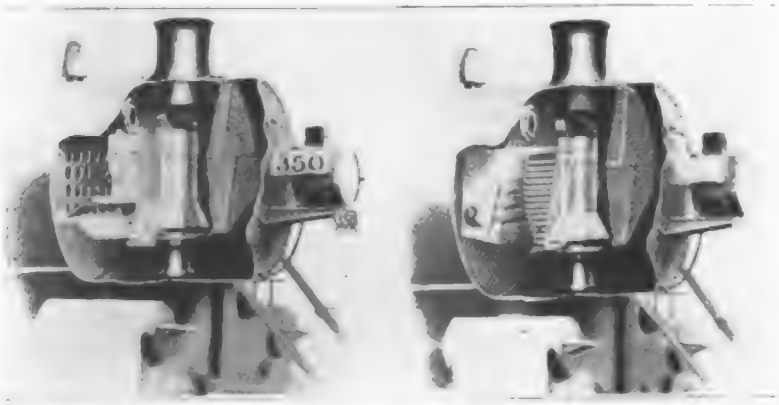
## LOCOMOTIVE SPARK ARRESTER REDUCES FIRE CLAIMS

Many states now require the use of spark arresters on locomotives, and, in any event, the considerable item of damage claims against railroads for fires set by engines calls for relief measures. An eastern railroad has equipped 500 of its locomotives with a form of spark arrester devised by its superintendent of motive power, with very satisfactory results. A slotted breaker plate with angular vanes, located between the damper and the netting of the smoke box, breaks up and deflects downward the larger sparks before they strike the latter. This netting, a screen of 3/16 by 3/4-in. mesh, is mounted in sections, for accessibility. The diaphragm table plate, under the stack, has inclined side sections attached to the sides of the smoke box, the horizontal center portion being perforated with 3/32-in. holes. This helps entrain the gases, and sifts accumulated particles to the bottom, where the draft carries them away.



The Horizontal Vanes of the Spark Arrester may be Seen Just in Front of the Damper, Which Is of the Single Type at the Left, and Multiple Type at the Right. Part of the Smoke-Box Netting Is Also Visible, and the Inclined Section of the Table Plate on the Far Side

## HURRICANES TO BE DETECTED BY NEW FLORIDA STATION

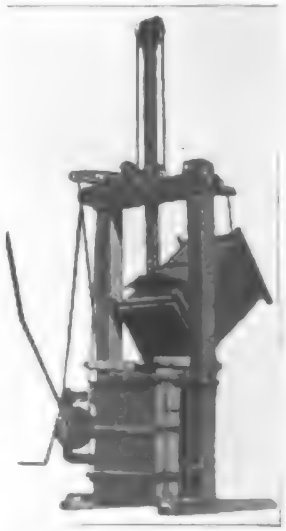
The states along the Gulf of Mexico are to receive more prompt warnings of West Indian hurricanes as a result of the establishment of a special meteorological station at Fort Myers, Fla. And with the return of the meteorological experts from France it has been found possible to reëstablish the West Indian service of the Weather Bureau. Both of these activities have become essential with the expansion of the American merchant marine and the expected growth of trade with the islands and with South America.

## FLEXIBLE SHAFT COUPLINGS MADE OF WOVEN FABRIC

The ordinary form of universal joint has found a competitor for many of its applications, in a new flexible shaft coupling made of fabric. This device, of English origin, comprises a series of laminations of cotton cloth, between a pair of tripod spiders on the ends of the shafts. The legs of the opposite spiders are not in line, but 60° apart, so that the power is transmitted through six sectors of fabric which intervene between the spider bolts. The fabric disks are laid with their warp-thread lines at different angles, to equalize the resiliency at all points of the circle. Flexibility and elasticity are varied by using special shapes of fabric, laid straight or biased.

## WOOL-BALING PRESS WORKS AS SHEEP ARE SHEARED

Some of the wool growers in Australia and in our own western states are using a wooden press which enables them to bale the wool as the sheep are sheared. The press is 5 ft. 6 in. by 4 ft. 7 in. and stands 12 ft. high; but as the receiving box turns down on hinges, all filling is done from the floor and no staging is needed. A wire rope, working over sheaves at the top, is wound upon a tapered drum, or fusee, so that the leverage increases as the bale becomes compressed. A catch instantly releases the side of the lower box for the removal of the pressed and corded bale, which contains 50 to 75 per cent more wool in a given space than with the former method of trampling it into bags.



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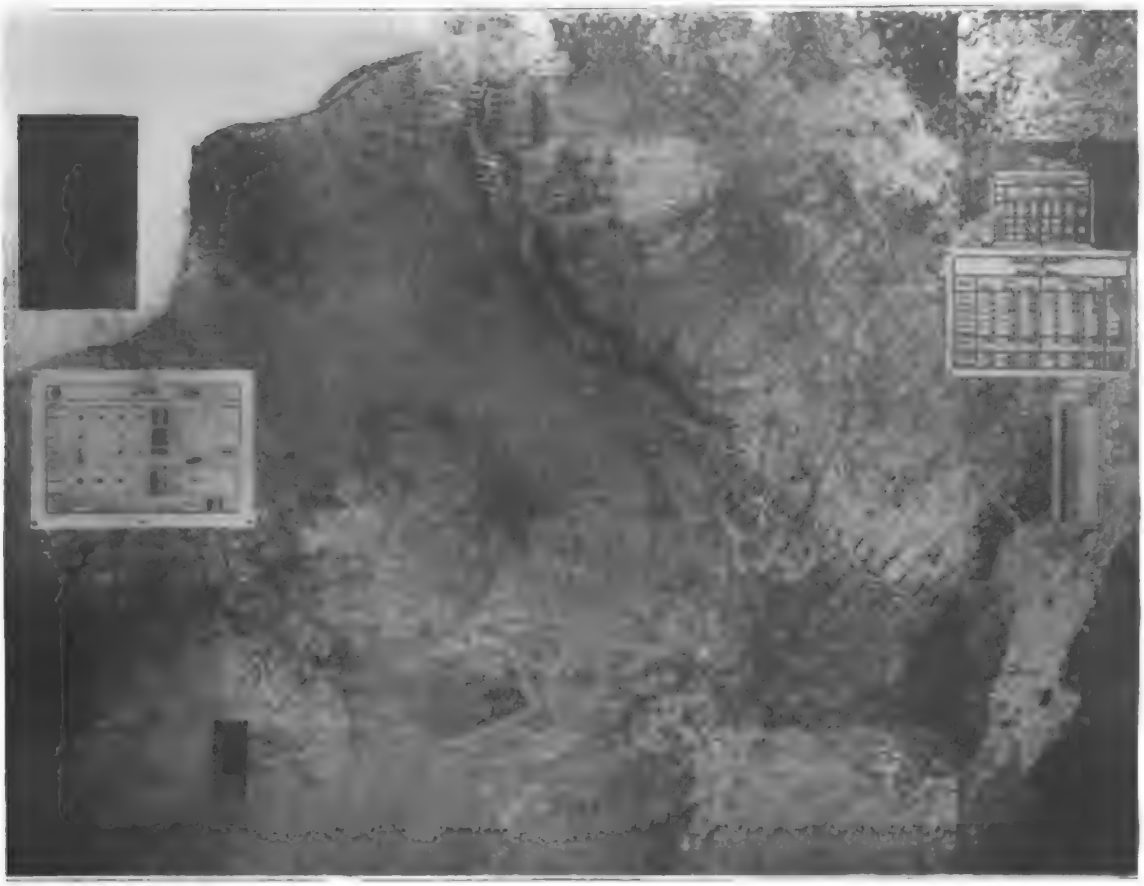

BY COURTESY OF THE SMITHSONIAN INSTITUTION

**On This Secret Battle Map of the Western Front One of General Pershing's Trusted Aids Formerly Showed His Chief the Daily Changes in the Long Battle Line by the Use of Colored Pins and Tags. The Map may Now be Consulted at the National Museum, Where It Offers an Exact Representation of the Military Situation at the Hour of the Armistice**

## PERSHING'S SECRET BATTLE MAP IN NATIONAL MUSEUM

As a result of a suggestion from General Pershing himself, there is now on display in the National Museum at Washington, D. C., the great battle map that formerly hung in a closely guarded room of the American G. H. Q., at Chaumont, France. Here, during America's participation in the active fighting, a member of the general staff recorded each day the changes in the battle line, the location of every division, and the limits of every army sector. Varicolored pins and tags were used, enabling General Pershing to acquaint himself almost at a glance with conditions along the western front. As the map stands now, it represents the exact military situation at the hour of the armistice. Just as it was once of inestimable value to the military chieftains, so with the coming of peace it is considered priceless by the historians who will some day analyze and describe the last campaigns of the greatest of all wars.

## FOREIGN TAR MAKERS EMPLOY CONTINUOUS DISTILLATION

Manufacturers engaged in the distillation of tar have previously been deterred from a general use of continuously acting stills by the complicated nature of the apparatus and the practical difficulties of operation. A satisfactory apparatus of this type is now used by 130 plants in England, Australia, and Japan, however, and is consequently being carefully considered by many American producers. The new process is automatic, each product of the "fractional" process coming over in uniform quality, and the pitch being discharged without interruption. The little attention required is easily given by an unskilled workman after a day's training. The plant takes less space and costs less than the old apparatus.

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¶ A mock chase and "arrest" were staged by members of New York City's aerial police force during the recent aeronautical convention at Atlantic City.

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# BURNING OIL AND EXPLODING TANKS WORK HAVOC

The Big Oil Fire, at Phoenix, Arizona, was Just Getting under Way When This Picture was Taken, the Fire Department Opening Its Attack with the Jet Dimly Seen at the Left

One of the Big Tank Motor Trucks was at a Filling Station When the Fire Broke Out, and had to be Abandoned to Its Fate

The Small Oil Drums in the Center of the Picture were Constantly Flying About, as the Contents of One after Another Exploded, Making Even Picture Taking Hazardous Work

Two Minutes After This View was Taken, the Oil Plant's 20,000-Gallon Gasoline Tank Exploded, Setting Fire to the Buildings at the Right, Which the Fire Department is Here Trying to Protect

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# DURING HALF-MILLION-DOLLAR FIRE IN ARIZONA

The Devastation Was Practically Complete, and Half a Million Dollars had Burned Up, When This View was Taken of the Wrecked Tank Cars and the Vast, Smothering Pall of Black Smoke

When the Big Gasoline Tank Blew Up, the North Half of It Passed Clear through the Dwelling Shown to the Left. Fortunately Its Occupant Was Not at Home

The Large Supply Tank at the Extreme Right Remained Unaffected, Though Oil Barrels were Exploding All around It, and the Flames under the Smoke Consumed Everything Combustible

**This Is the Half of the Big Gasoline Tank That Went South, Damaging an Automobile and Burning Off Its Top. The Entire Oil Plant was Demolished by the Fire and Explosions, Which Occurred on April 18**

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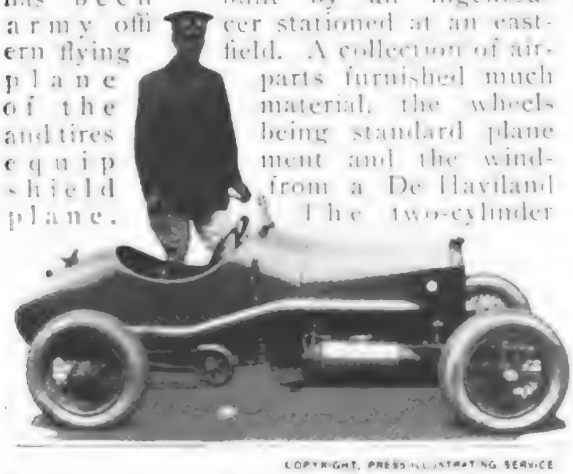
## SPEEDY LITTLE RACING CAR MADE OF AIRPLANE PARTS

A diminutive, but exceedingly active, automobile, modeled after a racing car, has been built by an ingenious army officer stationed at an eastern flying field. A collection of airplane parts furnished much of the material, the wheels and tires being standard plane equipment and the windshield from a De Haviland plane. The two-cylinder engine properly belongs to a motorcycle, and develops 20 hp. The car's limit is 70 miles an hour, and five gallons of gasoline, its tank capacity, is said to be sufficient for a considerable mileage.



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**Small Racing Car with Standard Airplane Wheels and Tires and a Two-Cylinder Motorcycle Engine: The Fuel Tank Holds Five Gallons of Gasoline**

## UNUSUAL ONE-PIECE LENGTHS OF HEAVY ELECTRIC CABLE

An armored, two-conductor electric cable, in one piece, 30 miles long and weighing more than 413,000 lb., might be expected to present some manufacturing problems; yet such a cable is now being made by an eastern firm for the U. S. Coast Guard. After the two conductors are twisted together with paraffined jute fillers, armored with No. 6 galvanized iron, and coated with jute and asphalt, the outside diameter is a little over 1½ in. An even greater length is required in a single-conductor, 1-in. cable of similar type, ordered by the Philippine government, which is being made in four 50-mile lengths, weighing 210,000 lb. each.

## TOWN FEATURES WATER FIGHT ON JULY FOURTH

In the mountain town of Ouray, Col., they celebrate Fourth of July with water instead of fireworks. "scrub" teams, of opposing volunteers arm themselves with fire hose of regulation size, and battle each other with torrents of icy water, forced from the city hydrants at 100-lb. pressure. The team which finally abandons its hose nozzle and takes to flight acknowledges defeat, and the successful contestants shout a loud "Ouray!" Sometimes it takes over an hour to reach a decision.

**Regulation Fire Hose and Nozzles are Used in the Water Battles with Which This Mountain Town Celebrates July Fourth**

¶ Despite the reported unrest in Egypt, encouraging business stability is indicated by a recent request for more American automobiles, for which payment is promised on the day the shipment leaves the factory.

**The Innocent Bystanders Are in Their Usual Positions of Danger as the Water Flies in Furious Combat, but No Casualties Result, or Colds Either**

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The Waterproof TNent, ormally Folded on Top of the Car, is Seen Here Spread to Its Full 20 Feet, with the Car Body for a Center Pole and a Dividing Partition between "Bedroom" and "Dining Room."

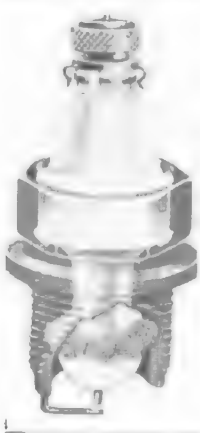
**The "Kitchen" is Seen in the Left View, with the Four-Burner Gasoline Stove in Operation. Folding Table and Stool and Plenty of Utensils Add to "Cookie's" Comfort. Convenient Storage Closets for Food and Medical Supplies Are Apparent above the Running Board at the Right**

## LIVING QUARTERS FOR FIVE IN AUTO FOR FIELD WORK

A remarkable automobile, providing living quarters in almost every sense of the word for a party of five, has been presented to the American Committee for Devastated France by a Rhode Island man. The body is built like a rear-door bus. A waterproof tent, folded on top of the car, spreads out to 20 by 14 ft., and needs no guy ropes. Four cots, bedding, five stools, and personal effects are carried on a two-wheel trailer. One sleeps in the car, his bedding being stored under a long seat at one side. A folding table takes care of "mess." Pantry and medical cabinets occupy one running board, with supplies packed in dust-proof tins and bags. On the other running board are a folding four-burner gasoline stove and the tinware cupboard. Special fixtures accommodate tools and utensils of various kinds.

## LOOSE BALLS IN SPARK PLUG KEEP CARBON AWAY

Of the making of spark plugs there will be no end so long as each new model can lay claim to some feature of actual improvement. One that cleans itself of carbon, invented by an Ohio man, has a series of rough-surfaced balls lying in the annular chamber between the metal sleeve and the porcelain bushing. Supported by flanges on sleeve and bushing, these balls are kept in more or less constant motion by the explosions and vibration of the engine, thus cutting away the carbon as fast as it is formed.



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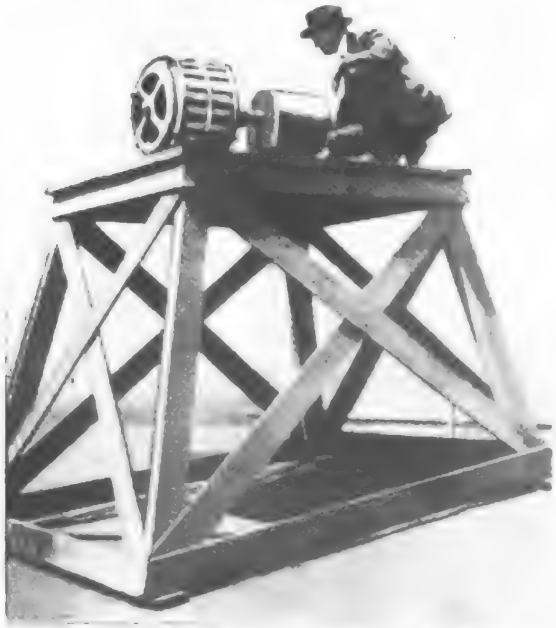
## ELECTRIC SIREN REPLACES ARMY BUGLE

In a government military construction center in the West the great number of workmen employed has resulted in a gradual discarding of several traditional army practices. The substitution of the siren for the bugle is typical. The siren in the illustration, driven by a 2½-hp. motor, is used at an aviation field to call the men to work in the morning and afternoon, when its shrieks can be heard for miles about the countryside.



**Shrieks from This Electrically Driven Siren Whistle Call Soldier-Mechanics to Their Work in the Shops at a Government Aviation Field**

## TWO UNCOMBINING SUBSTANCES FOUND IN PROTOPLASM

During the last 60 years the biologists have devoted much time to the study of protoplasm, the grayish, semifluid matter held to be the physical basis for all animal and vegetable life. They have learned much, but much remains a mystery. Interest is consequently aroused by the announcement from a prominent biologist that the all-important substance is chiefly formed of two components which do not unite chemically, but mix with each other in finely divided form. This same scientist may be remembered as the experimenter who hastened nature's slow process of evolution by injections into the ovaries of certain plants. Using, among other agents, a weak solution of stimulating mineral salts, he is said to have charged the cells before fertilization so that the new life later developed from the cells so treated appeared as a different form of species.

## AIR-OPERATED CONTROL FOR WATER-TANK FEED

To control automatically the supply of water pumped to a storage tank, as commonly used at country places, an English system depends upon air pressure to close the motor switch. On the supply pipe at the pump is an air chamber, equipped with a special switch. The closed storage tank has a small air vent. A full head of water in the tank maintains sufficient pressure in the air chamber to keep the switch open. At a certain low point, however, pressure is so reduced that the switch closes and the pump starts. A relay is used in heavy installations.

## HANDLES OF "MEDICAL COIL" CARRY WHOLE EQUIPMENT

A common flash-light dry battery in its tubular metal case forms one handle of a novel form of "medical coil," or electrotherapeutic set, now on the market. A similar metal tube, forming the other handle, contains the induction coil with its interrupter. The instrument is completed by the flexible cord that connects the two parts. A socket in the battery handle receives the stem of a sponge applicator if desired, and a switch is provided to divert the current from the tube to the sponge.

**The Two Left-Hand Views Show How Battery and Coil are Contained in Two Handles. The Set is Seen in Use at the Right, with Sponge Applicator Attached**

A core tube sliding in the coil regulates the current strength.

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# THE PERISCOPE BECOMES AN EVERYDAY UTILITY

There need Be No Thought of War When Anyone Says "Periscope" Nowadays. Here Is a Trolley-Car Motorman Looking through One, Conveniently Mounted on the Front Platform, to See if All the Passengers Are On

For Watching a Baseball Game without Paying Admission, These Boys Find a Trench Periscope Better than a Knot Hole; and Besides, It Has an Excitement All Its Own

Submarines Are No Longer the Only Kind of Boats Armed with Periscopes, for This Motorboat Owner Finds His Very Useful While Steering in a Narrow Stream or Crowded Harbor

This Railroad-Crossing Flagman need Not Even Step Out of His Door to Keep Track of the Trains That Pass, Because the Periscope, Projecting from His Window, Gives Him a Full View of the Road

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## SILO BLOCKS OF CONCRETE MAKE GOOD BRIDGE ARCH

Because concrete silo blocks are curved, it occurred to a rural contractor in Michigan that they should make excellent arch units for small bridges. The application of this idea proved both practical and artistic. After building up the arch ring with the blocks, side walls are cast in monolithic concrete, and posts and rails erected of the same material. For making the curved blocks, he uses a machine of his own design, in which the sides of the mold are operated by a treadle.

That a Bridge Made of Concrete Silo Blocks Is Artistic as Well as Substantial is Revealed by This Picture of Such a Structure in Michigan. The Posts and Rails Are Also of Concrete

## PORTABLE GENERATING PLANT DRIVES STUMP DRILLS

A portable generating plant of recent design has been used to excellent advantage by a Georgia concern for operating drills with which old stumps in turpentine fields are bored for dynamite charges. The plant is driven by an internal-combustion engine, the whole equipment being mounted on a wagon so that it can be drawn about, as desired. It is a 4-kw., 60 to 100-volt outfit, and supplies power for two large drills.

Portable Generating Plant Used in Georgia Fields to Bore Stumps for Dynamite Charges: With These Power-Driven Drills the Men Do Many Times the Work They can by Hand

## SIGNS MAKE MOTORING EASY ON TRUNK HIGHWAYS

Wisconsin's 5,000-mile trunk highway system, reaching nearly every important city and village, is marked so thoroughly that strangers often motor from one end of the state to the other without making a single inquiry about roads or directions. Incidentally the new system appeared quite dramatically, not long ago, when the old inadequate signs were replaced by the new standardized markings during a single week. The success of the system is attributed to the rather unusual idea of giving an official number to each of the 68 routes throughout the state, as, for example, on Route No. 10, which connects Beloit, Madison, and Duluth, the numbered sign appears at intervals en route, and on connecting streets in cities and villages. In this way, knowing the number of the route he is to take, the tourist simply follows his number to his destination. Despite its present efficiency, however, additions to the system are contemplated. Other signs will give directions and distances to all important cities in or near the state; wooden "milestones" will enable a traveler to report definitely a bad stretch of road; boards at the boundaries of each patrol section will announce the name and address of the responsible patrolmen, and at the county lines, the name and address of the county commissioner.

¶Possibility of a German trade revival to anything like prewar magnitude recently received another setback when the American government purchased outright the piers of the old Hamburg-American line at Hoboken, New Jersey.

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This Is a Bit of the "Campus" of the American Army University at Beaune, France, Showing a Few of the Many Substantial Tile-and-Concrete Classrooms

The German Locomotive Seen at the Left, and the American Model at the Right are Now being Used by Students at the American Army University in France

## AMERICAN ARMY UNIVERSITY BUILT ON USUAL BIG SCALE

The American Army University at Beaune, France, another of the A. E. F.'s large-scale achievements, was mentioned in Popular Mechanics Magazine for May, 1919, as the most striking feature of the army's educational program. Recent material additions have again made it worthy of comment. To the buildings of the old American base hospital have now been added row after row of barracks, mess halls, recitation rooms, laboratories, work rooms, and offices. A model bakery turns out big "homemade" loaves of bread for the student-soldiers; a model laundry keeps their clothes clean. Throughout the square mile covered by the school have gone macadamized roads, wires for electric light and telephone communication, and railroad switches from the main line to the many machine shops. The whole big task has been done with the quiet thoroughness which the folks in America have come to expect of their army in France.

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¶A coal yard with a storage capacity of 30,000 tons, intended for various Federal departments and buildings, is now operated by the government in the city of Washington.

## LOAN TOTALS REGISTERED ON BIG ADDING MACHINE

One of the cleverest of the many schemes used to advertise the Victory Liberty loan was the monster adding machine which rested in front of Detroit's city hall during the campaign. Thousands gathered each day to see the 24-hours' balance appear on the 10½-ft. ledger page, while the dials in front of the machine registered the total subscription. The machine was made chiefly of wood, and measured 34 by 22 ft. in plan, with a height of 30½ feet. Four searchlights provided illumination at night.

This Mammoth Adding Machine Announced Each Day Detroit's Total Subscription to the Victory Liberty Loan. The Ledger Page Itself Is More Than 10 Feet High

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## SMALL, LIGHT HAND LOOM IS BOON TO INVALIDS

Invalids Find Pleasant Occupation with This Small Hand Loom. The Warp Threads are Kept Taut by being Stretched from a Bedpost to the User's Waist

Weaving, oldest of useful arts, commends itself to the inexperienced for the simplicity of its processes. A hand loom so small that it may be carried in a hand bag, yet capable of weaving excellent belts, bags, cravats, trimmings, etc., is now in use at an eastern sanitarium, where patients unable to leave their beds can readily use it. The heddle is 7½ in. high and 5¾ in. wide, and the shuttle 6 in. long. One end of the warp threads is fastened to a bedpost or other fixture, the opposite end being tied around the user's waist, and thus easily kept taut. Alternate warp threads are passed through eyes in the needle in the usual manner. A wood roller at the weaver's end gathers the woven fabric.

## COAL PUMPED FROM RIVER IN FORM OF PEBBLES

Sifting Drum on the Dredge Boat, Which Receives the River Coal from the Pump and Separates It from the Mud, Sand, and Stones

This Load of Coal, Which has Just been Dumped into the Barge, Gives an Idea of the Form This Curious River Product Takes. It Is Like a Mass of Rounded Pebbles, and, of Course, Quite Clean

Coal in the form of smooth, rounded pebbles has been discovered in large deposits in the bed of the Susquehanna River, where it flows along the base of Montour Ridge in Pennsylvania. Hydraulic dredges are being used for the operation of mining it, the buckets bringing up the little carbon lumps free from dust, of course, but mixed with mud, rocks, and sand. The conglomerate is automatically dumped into a sifting drum, which segregates and rejects these impurities. The coal, of very good quality, is then shoveled onto barges which lie alongside the dredge boats. The cleanliness of this form of mining is a feature that appeals to the workers, contrasting strongly with other operations in the state.

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**Exposed at the Left Are the Contents and Parts of One of the "May-Day" Bombs, Mailed in New York under the Counterfeit Wrapper Reproduced at the Right, but Stopped by the Vigilance of Postal Authorities**

## SEIZURE OF BOMBS IN MAIL FOILS ANARCHIST PLOT

Discovery by postal authorities of a large number of dangerous bombs, which had been mailed in New York during the last days of April, undoubtedly saved the lives of many prominent men. Cabinet members, federal jurists, and other national figures were included in the list to which the parcels of destruction were addressed. The bombs were all alike, each consisting of a cylindrical wooden box 7½ in. high, containing a stick of dynamite, a ¼-oz. bottle of explosive fluid, and three fulminating caps wadded in cotton. Every wrapper bore an address label counterfeiting one used by a large New York store. Though a few escaped the post-office searchers, only one did any harm, injuring two women who essayed to open it.

## ESCAPED LIONESS DRIVES TOWNSPEOPLE TO CELLARS

When the circus lioness broke from her cage at Woodbury, N. J., recently, the residents of that little town were just as scared as could possibly be. The trouble started through the carelessness of a colored keeper who entered the cage without locking the door, and stooped to fondle the mother's cubs. Rushing upon him from another compartment, the resentful lioness seized his neck and crushed it with a snap of her jaws. Panic followed, while attendants beat the animal in efforts to induce her to release the mangled corpse. Breaking through the unlatched door, she streaked out of the tent and into a near-by wood. Those inhabitants of the town who were not enjoying the protection of their cellars, then joined forces with the circus crew and were able to kill the beast after firing over 100 shots.

## SHIELDS FIRE RANGER'S EYES FROM MOUNTAIN GLARE

Among the discomforts to which fire rangers of the national forests are inured is the glare of the sun on high peaks. In the interest of better vision, however, one of them has devised a shield in the form of a box fitting over the eyes, provided with an observation slit in front. Ridges in the blackened interior cut off all rays not needed. The shield also protects the eyes from the high winds.

¶ In the mud bottom of a lake in Swed a "tin hat" has been discovered which, archeologists declare, is some 600 years old and represents a type worn by the vikings. It resembles those used by the American army, but the visor weighs over four pounds.

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## STRETCHERS ON MOTORCYCLES FOR INJURED AUTOISTS

Already famous for its establishment of roadside conveniences, an English automobile association now has added a first-aid service. A telephone call from any of its frequent wayside stations brings, if needed, a motorcycle with a stretcher-bearing sidecar, equipped for any emergency, from carrying a casualty to repairing a wrecked car.

Motorcycle with Stretcher Sidecar, Used by an Auto Association in England for Giving First Aid to Distressed Members. In the Background Is One of the Association's Frequent Wayside Telephone Stations

## MARSHAL FOCH DONE IN SOAP FOR WINDOW DISPLAY

To draw the eyes of the crowd to his window display of castile soap, a shopkeeper secured a bar of the same material, measuring 18 by 24 in. He placed it in the hands of a sculptor, who carved upon it, in bas-relief, a faithful portrait of Marshal Foch.

More than 8,000 American-made tractors were shipped into Canada during the months of December, 1918, and January, 1919, to the despair of Dominion tractor makers who are calling for a prohibitive import duty.

## COLLEGE COURSES IN COAST ARTILLERY TO BE REVISED

During the world war, the Coast Artillery of the United States Army furnished officers and enlisted men, not only for the coast defenses of this country, but for the railway and other heavy guns, for the anti-aircraft, and even for part of the trench artillery. And in consequence of these enlarged and varied functions, the training of Coast Artillery reserve officers in American colleges and universities will henceforth be considerably broadened and varied. It is hoped to increase the number under instruction each year to 1,500 students. During the school term these men will be instructed by army officers in general military science for two hours each week. But during the six weeks at the summer camps the training will be altogether military, embracing a broad grounding in artillery methods, and practical, specialized work in anti-aircraft and heavy, mobile artillery, and in artillery of position. Five schools have already accepted the establishment of such instruction units, while proposals from 14 other universities and colleges are under consideration by the war department.

## WASTE PARAFFIN AND PAPER SALVAGED BY NEW PROCESS

As a result of recent experiments, a U. S. Forest Products Laboratory is able to describe a method for recovering a large part of the eight or 10 tons of material wasted daily by manufacturers of paraffined paper and the familiar cartons and cups. The waste material, consisting of paper impregnated with paraffin, is finely shredded, and treated with a petroleum-oil solvent. Carried off in the solvent, the paraffin and oil are then separated and both are used again. In addition, the solvent clinging to the paper pulp is recovered by a steaming process, and the pulp itself made once more into paper said to be fully as strong as the original.

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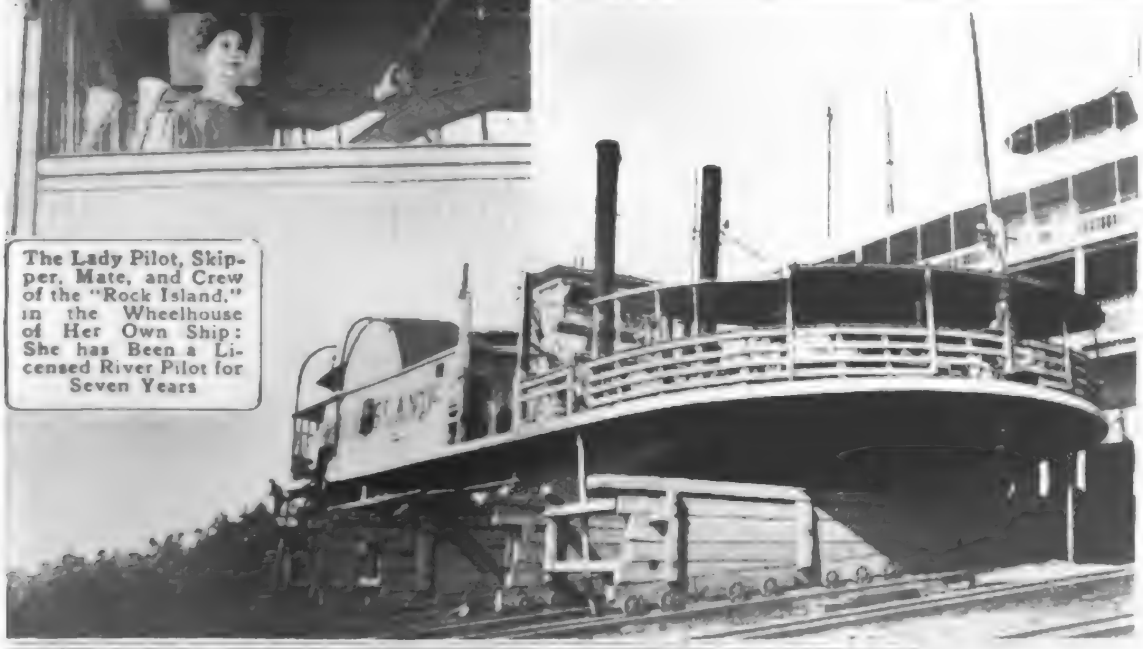
# WOMAN RIVER PILOT IS CAPTAIN, MATE, AND CREW

Here Is the Good Ship "Rock Island," the Only Passenger Steamer Owned and Piloted on the Difficult Waterways of the Mississippi Valley by a Woman. As It is Seen Here, It has Just been Launched at Mound City, Illinois, on the Ohio River Just above Its Mouth

The Lady Pilot, Skipper, Mate, and Crew of the "Rock Island," in the Wheelhouse of Her Own Ship: She has Been a Licensed River Pilot for Seven Years



**The "Rock Island" on the Ways, Just Before Its Launching at Mound City, Which Operation the Owner Superintended: The Picture Shows the Method Used in Launching River Steamers, down in "Egypt," Illinois**

A striking example of woman's adaptability to strange professions is the success of a feminine pilot whose boats ply the waters of the Mississippi Valley. Not only is she adept in threading the fickle channels romanticized by Mark Twain, but her trading ventures seldom result to her disadvantage. A middle-aged, unassuming woman, it is her practice to buy a boat, select a promising community on the Father of Waters or one of his big tributaries, establish an active ferry traffic, and then sell out, only to repeat the cycle of operations elsewhere. Her personal supervision during the overhauling of a boat is assurance that the work will be thorough and rapid. On the rivers for 16 years, she has been a licensed pilot for seven; and the only man on her boat is the engineer.

## STEEL TERRACING MACHINE PREVENTS SOIL EROSION

Erosion of farm soil, with its costly waste, can be prevented by proper terracing and ditching. A late development in machines for this work consists of a steel cutting blade, 5 ft. long and 14 to 17 in. wide, with both upper and lower edges flanged and sharpened, and hinged to work at any angle. In grading, it will shed dirt at 60°, and in ditching, at 30

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to 45°. The steel landside, ⅜ in. thick, 10 in. wide, and 9½ ft. long, has tempered-steel guide fins to prevent skidding. A rolling colter cuts the turf in front

This Terracing Machine, Useful as Well for Ditching and Grading, Is All Steel and Cuts without Clogging or Skidding. To Haul without Cutting, It is Turned Up on Its Landside

and helps keep the machine in line. The implement weighs 365 lb. and accommodates two men on its steel running board. Four horses are used for the maximum results.

## MODEL TENEMENTS TO REPLACE CONGESTED CITY SLUMS

Despite the Londoner's reputed prejudice against life in the "tenement" buildings so well known in American cities, much interest has been aroused by the plans of a public-spirited duchess for several structures of this sort to be erected in one of the most congested sections of the metropolis. She would fit them with bathrooms and hot water on every floor, conveniences most unusual in the great slum districts, yet not half as rare as the playground she would provide for the roof, the baby-carriage "garage" in the basement, and the central laundry with mechanical driers, located on one of the lower floors.

¶ Purifying the water in more than 400 wells in France's invaded territory is the gigantic task undertaken by the ministry of the liberated regions. It is expected the work will be finished before the summer is over.

## FLYING BOAT HITS LOCK OF PANAMA CANAL

An accident of rather unusual nature recently cost two lives at Miraflores Lock on the Panama Canal. Two officers were in a flying boat piloted by a third. Engine trouble suddenly forced the pilot to try a landing in the waters of the canal just beyond the lock. Unfortunately, however, he was already too low; and barely clearing the first gate of the lock chamber, the plane struck the second, throwing the three men into the water. Only the pilot escaped with his life.

## PAVEMENT BECOMES BILLBOARD FOR LOAN CAMPAIGN

An unusual publicity medium was devised by the Philadelphians charged with advertising the Victory Liberty loan. In addition to the usual bunting on buildings and poles, they decorated Broad Street for an entire city block by painting on the pavement, in red, white, and blue, a great "V" surrounded by a border of smaller "V's." Perhaps this is only a fore-

COURTESY EVENING PUBLIC LEDGER

This Block of Painted Pavement Shows How Philadelphia Campaigners for the Victory Liberty Loan "Painted the Town" in a Good Cause

cast of the day when a business man first constructs a horizontal billboard to catch the eye of the airplane commuter.

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**Members of an English Society for Preserving Angling in the River Thames are Seen at the Left Carrying Perch, Roach, and Other Species of Fish to the River, to Restock It for Future Fishing. At the Right the Small Fish, Just Caught at Hampton Waterworks, are being Transferred to the Carrying Tank**

## ENGLAND'S RIVER THAMES RESTOCKED WITH FISH

Restocking lakes and streams with fish for the benefit of anglers is not wholly peculiar to America. A society whose purpose is the preservation of the gentle art along the River Thames, in Izaac Walton's own land, places thousands of young fish in the stream every year. Perch, roach, and other species of the locality are captured with nets at waterworks and reservoirs, and transferred in huge cans to the river.

## MOTORCYCLE WINDSHIELD ADDS TO SPEED AND COMFORT

In addition to protecting the motorcyclist from the usual chilling wind pressure, a thin sheet-metal windshield has been found to add ten miles an hour to the speed of the machine. The decreased wind resistance is also reported to result in an increased fuel mileage of from 10 to 15 miles a gallon. Light from the headlight passes through two glass-covered holes in the shield.

## DEMONSTRATES AUTO DYNAMOS WITHOUT RUNNING ENGINE

To eliminate the nuisance of motor noise and gas in the display room, a Los Angeles motorcycle agent devised a method of demonstrating lighting generators for motorcycles and autos without running an engine. The lights are mounted on the top bar of a tubular frame, and the generator on a lower bar. Effects at different speeds are shown by adjusting the electric driving motor inside of the show case on which the frame rests. This simple device is credited with causing an immediate increase in sales.

**Frame of Metal Tubing Arranged to Hold on Its Bars a Lighting Generator and Several Automobile or Motorcycle Lamps: Electric-Motor Drive Makes It Unnecessary to Run an Engine in the Showroom**

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# THEATER NURSERY ENABLES MOTHERS TO SEE SHOW

Theatergoing Mothers may Safely Leave Their Babies in These Cribs While They Watch the Performance

Many a mother can testify to the small baby's utter lack of appreciation for the subtleties of the drama. In fact, the baby's tendency to crow as the heroine expires, and to weep clamorously at the big joke of the evening, has resulted in a policy of rigid exclusion in most theaters. To obviate this, however, the builders of a new Chicago theater instructed their architect to include a real children's room in his plans. So he provided two big rooms which occupy almost the whole of the third-floor front, between the gallery promenade and the street. And mothers' kiddies can now sleep in a dainty nursery, or romp in the cheerful, airy playroom which contains every one of the nonbreakable joy-makers dear to childish hearts. They are all there, merry-go-round, seesaw, shoot-the-chutes, and a regular army of woolly dogs and friendly dolls. The decorative scheme is of the conventional type, with gayly colored curtains and painted walls, on which appear the immortal characters of nursery lore.

Conveniently Located Just off the Gallery Promenade Is This Theater Playroom Which Keeps the Children Busy While Father and Mother See the Show. The Nursery for the Littlest Tots may be Seen through the Open Door at the End of the Room

# ALTAR OF VICTORY FEATURES LOAN CAMPAIGN

During the Victory-loan campaign, Chicago's famous downtown lake-front boulevard was transformed by an unusual decorative treatment. Thirteen continuous blocks were christened the "Victory Way," and decked with flags, ferns, colored lights, and statues, while huge illuminated obelisks marked every street intersection. Midway stood the open-air auditorium, or Victory Forum, in which great audiences assembled to view the displays of war material and listen to music and speeches. Forming the background for the platform stood the center

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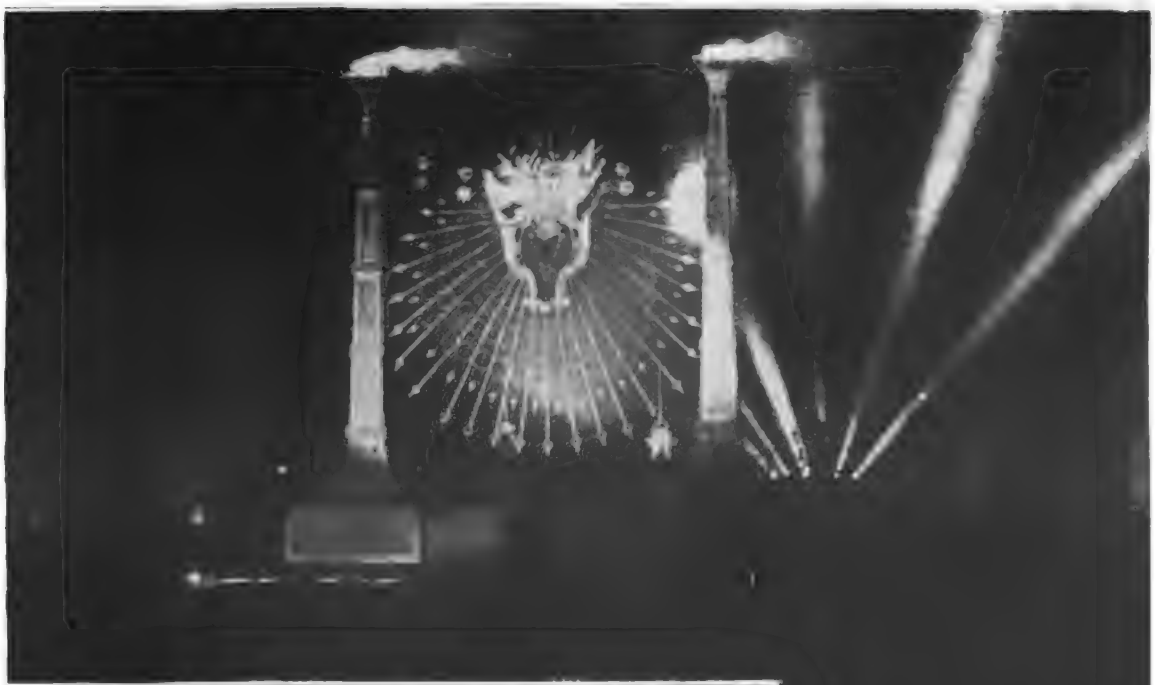

The Daylight View, at the Left, of Chicago's Lake Front Victory Forum Shows the Display of War Material and the Jeweled Altar of Victory. Above will be Seen in More Detail the Jewel-Studded Curtain in Its Blaze of Light, and the Two Slender Columns from Which Rose Clouds of Illuminated Steam

This 36-Inch Searchlight was Furnished by the Coast Artillery to Boost Chicago's Victory-Loan Campaign. The Unit Rides in Two Trucks, One Supplying the Power, the Other Bearing the Projector on a Pivoted Arm Which Permits Elevation to a Height of 22 Feet. The 12-Inch Railway Rifle Was Another Feature of the Display

of all interest, the Jeweled Altar of Victory, graceful in the sunlight, but really beautiful at night, as 30,000 colored "jewels," formerly used in the San Francisco Exposition, shattered the light from 11 monster searchlights. Four of these searchlights, by the way, were designed for the aerial defenses of Paris, but were diverted by the armistice to these more peaceful tasks. The whole altar was essentially a jewel-studded curtain, 60 by 60 ft., suspended between two slender 80-ft. columns, atop each of which were powerful colored lights which mingled their rays with jets of steam, creating a striking illusion of smoke and flame. The whole work was a bit of harmonious and well-balanced beauty.

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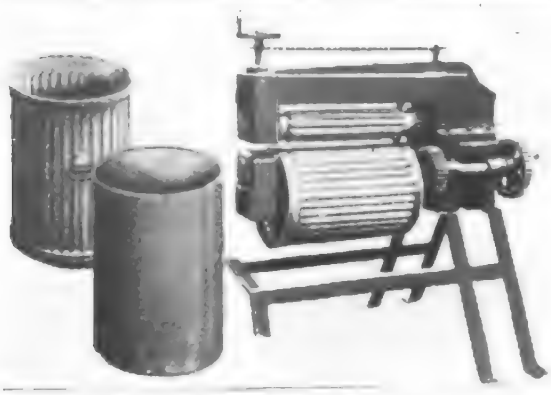
## MACHINE CORRUGATES BARREL BLANK IN THREE MINUTES

One galvanized-iron barrel can be corrugated every three minutes with a machine now on the market. In operation,

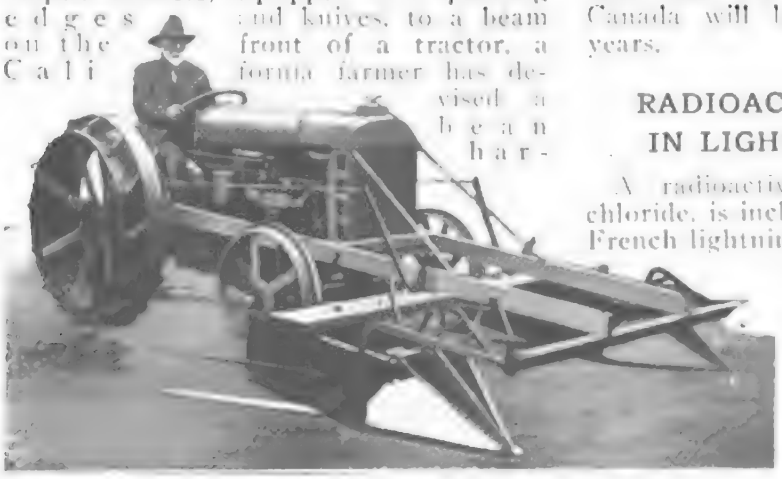


The Blank in the Middle is Corrugated between the Rollers of This Machine, Finally to Become the Finished Galvanized-Iron Barrel at the Left

the workman inserts the barrel blank, curved to the desired shape and held by a side seam, between the geared steel rollers. Starting the machine, he revolves the horizontal hand wheel which actuates two adjusting screws, bringing the upper roller into contact with the work, and thus stamping the corrugation on the blank. An advantage claimed for this method is that the lengthwise seam is pressed flat during the operation.

## BLADES ON TRACTOR HARVEST BEANS AND OTHER CROPS

By attaching a pair of nose-shaped runners, equipped with plowing edges and knives, to a beam on the front of a tractor, a California farmer has devised a bean harvester useful for a number of other purposes. The beam is adjustable for elevation, so that the knives may be held at the desired elevation for cutting stalks, or the plow edges may make a shallow furrow in the ground. Two runners cut four rows, but a third runner may be added if desired. The attachment cuts weeds and harvests—besides beans—peas, onions, garlic, and other crops, which it leaves in windrows.



Bean-Harvesting Attachment for Tractor, with Adjustable Cutting Blades and Plows, Which Throw the Harvested Crops into Windrows; Depressed, the Plow Points Cut Shallow Furrows, a Third Point being Added if Desired

## EXPLORER WOULD USE WASTES OF NORTHERN CANADA

Life among the Eskimos who had never seen or heard of white men, expeditions to Cape Parry, to the delta of the Mackenzie River, and to other points on the dreary north coast of Alaska and Canada, all make Vilhjalmur Stefansson, the arctic explorer, one of the world's authorities on questions concerning the arctic lands of North America. And, in consequence, the Canadian government has listened with the closest attention to his plan for the development of this virgin region by the introduction of herds of reindeer and the domestication of the musk ox already there. He points to more than 1,000,000 square miles of grazing land, totally unfitted for ordinary cattle, but almost ideal for these two hardy species. The reindeer would flourish there almost without question, in view of the astounding growth of the herds given to the Eskimos of arctic Alaska by the United States Government about 20 years ago. And it seems certain that the hairy little musk ox would do equally well with state care and protection. The explorer feels confident that the waste lands of northern Canada will be transformed within 25 years.

## RADIOACTIVE SALTS USED IN LIGHTNING ARRESTER

A radioactive salt, such as radium chloride, is included in the tube of a new French lightning arrester of the vacuum-tube type, used in protecting electrical circuits from high-potential discharges. The consequent ionizing of the electrodes is declared to reduce the retarding effect of the spark gap so that the action of the arrester is practically instantaneous.

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# THE "HERMIT'S" PROTEST

IN our April magazine we published an interesting story of a California hermit who was such an attraction to tourists that the management of Yosemite Valley had induced him to make his residence in the park for a certain period of the year. Shortly following, greatly to our surprise, we received a letter, beautiful in script, from the hermit himself. We were pleased to learn that a bona fide nature-loving recluse could not be induced to change his haunts for profit as one changes a position in commercial pursuits. There is enough of the hermit longing in every thinking man and woman to induce us to depart from our custom of avoiding personal matters and publish the letter verbatim, trusting that our contented friend may not be the subject of too much envy.—Editor.

In the April (1919) issue of Ur magazine there appeared an article about a Hermit near Palm Springs, Riverside Con. Cal. who was said to have been "transplantet" to Yosemite Valley, Cal. to draw curious tourists.

Well, I am that "Hermit," yet I *don't* know anything about that "transplanting" proposition. My name + Photo has appeared in a number of Papers + Magazines, mostly without my knowledge or consent + always *misrepresentet* and now comes this *greedy* promoter *misusing* my name to *deceive* the public + I wonder just how much right any person has, by Law, to use or misuse another's name, without his knowledge, to *deceive* the unwary public? In 1918 I worked for 5 weeks at Camp Curry, Yosemite, when I left was asked to return in 1919 to take a certain job, but I gave no promise or encouragement. These 5 weeks were more than enough to convince me that there is no better place for an undisturbet outdoor life than the little inhabitet vastness of the Desert with its dry climate + absence of mosquitoes.

Where the Hermit Now Lives: This Cabin is Built Entirely of Palm Logs and Leaves, with the Exception of the Doors and Windows. However, a Dirt Road has Recently been Constructed near It, Making It Too Dusty for One Who can Live Wherever Nature Most Invites

I am still living near Palm Springs, in a cabin built of Palm Logs + Leafs, *not* in a Cave. + won't leave here just to play into some promoter's hands. Should I leave, I will do so when I please + go where I please, none has strings on me + my trail is allways open.

Hoping that U please will print this to help Ur readers I am respectfully Urs

Wm. Pester, Hermit

The View on the Left Shows a Cabin Built of Pine Leaves on a Frame of Young Sycamore. The Hermit Lived Here Several Years. There Is a Hot Sulphur Spring in the Vicinity. Malicious Persons Burned This Attractive Desert Dwelling. At the Right is Shown a Favorite Haunt of the Hermit—Palm Cañon

¶ Post-office authorities have announced that registered mail will now be accepted for delivery in both Turkey in Europe and Turkey in Asia.

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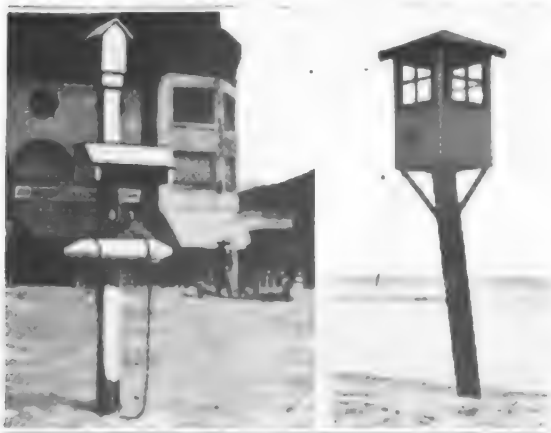
These 3,500 and 4,000-Ton Wooden Ships of the Emergency Fleet Corporation Are Part of the Fifty Which Lie Idle in the Harbors of the Pacific Coast. The Green Timbers Used in Their Construction are Said to Have Shrunk on Their Maiden Voyages, Making Them Totally Unseaworthy

## LIFE-PRESERVER STYLES AFFECTED BY WAR

Torpedo-shaped life preservers are the unusual feature of the life-saving precautions taken at a Pacific coast bathing



The Authorities at a Pacific Coast Bathing Beach have Installed These Torpedo-Shaped Life Preservers, and Erected the Tower from Which a General Watch will be Kept

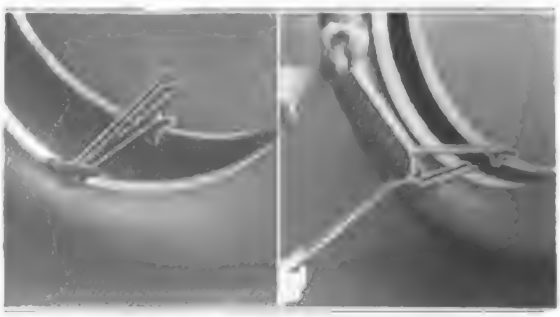
beach this season. As a reason for the change from the traditional doughnut type, it is said that the warlike model is much easier to throw, and to pull through the water. In their attempt to safeguard the bathers in every possible way, the authorities have placed these torpedo-like preservers at frequent intervals along the beach, and have erected an elevated lookout station from which a general watch may be kept.

## GREEN TIMBERS RUIN SHIPS OF EMERGENCY FLEET

More than fifty new wooden steamships are lying idle in various harbors along the Pacific coast, with the prospect of continuing to lie there until they fall apart from old age. They offer a mute testimony to the inevitable waste of wartime construction, as they were hurriedly built by the Emergency Fleet Corporation, of green timbers which are said to have shrunk on their maiden voyages, permitting the seas to pull the calking out of the seams. They have therefore been declared unseaworthy, and now represent a total loss to the government, as no private interests will charter them.

## TOOL FOR SPREADING TIRES IS HELP TO MOTORISTS

A tool is most desirable when it lightens a back-breaking task into an easy one. Automobile drivers are all too familiar with the strain of spreading apart the beads of a tire. A simple tool, made of three pieces of cold-rolled steel, now does the job with the smallest of efforts. It consists merely of a long and short spreader jaw, hinged to a curved hand lever. When the spreader is inserted, pushing the lever forward and down locks the tire in open position. A larger model, for big truck tires, has two levers and requires the use of both hands; but so employed, it handles with ease the largest



The Spreader, Handles Open, is Inserted in the Tire, as at the Right. When the Handles are Closed, as at the Left, the Tire Beads are Held Apart

sizes of pneumatics made, of which unassisted manual manipulation is all but impossible.

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## BRITISH PREMIER'S ALTERED DH-4 SHOWS UNUSUAL SPEED

General Seeley, British Under-Secretary for the Air, was recently carried to Paris in record time by Premier Lloyd George's De-Haviland biplane, pictured on page 511, Popular Mechanics Magazine for April, 1919. The distance from Folkestone, near Dover, to Paris, practically 170 miles, was covered in only 74 minutes. The remarkable feature of the performance, however, is the general's belief that the high speed was made possible by the shape of the fuselage, enlarged and covered to protect the distinguished passengers. It is said to decrease wind resistance so decidedly that speed is increased 10 miles an hour.

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¶ The fishing interests of Alaska are petitioning for legislation that will protect the spawning grounds of the salmon from the depredations of the ignorant and irresponsible.

## BOSTON'S GERMAN HOWITZER CLAIMED BY TWO STATES

Boston Common now boasts an ugly German howitzer which was captured near Chateau-Thierry last July. The folks in Boston insist that the big fellow was taken by doughboys from Massachusetts, but a congressman from Connecticut is equally sure that boys from his state turned the trick. He has stated that he will attempt to secure congressional action unless the gun is removed to Hartford.

The Present Question Is, Who Captured This German Howitzer, Now on Boston Common. A Connecticut Congressman Claims the Gun for His State; Massachusetts People Are Equally Certain That Troops from Their State Had the Honor

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## NEW CHAIN CONVEYOR REMOVES DANGER TO STEVEDORES

The installation of traveling-chain conveyors for loading hand trucks from boat deck to pier level has always proved an economy. The apparatus pictured is driven by an electric motor through a clutch that slips on overloading to prevent breakage. It is fitted with a joint near the top to allow for rise and fall of the tide, carries a pusher to engage with the truck axle every 12 in., and has the added advantage that the pushers drop through the pier floor in a vertical position, avoiding all danger to the feet of the stevedores, and thus removing a long-standing objection to machines of this sort.

The Distinguishing Merit of This Traveling Chain Conveyor Lies in the Arrangement of the Pushers Which Engage with the Truck Axles. On Reaching the Warehouse Floor They are Drawn Down Vertically, Thus Obviating Danger to the Feet of the Stevedores

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¶ Rats have developed such a taste for casein glue that it is now declared dangerous to hold in storage an airplane made up with that substance.

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The American Lieutenant Who has Recently Astonished the Oldest Airmen with His Leaps from One Plane to Another Explains That He Simply Climbs Past His Pilot, Worms His Way under the Wing, and Sits on the Axle of the Undercarriage. Here He Waits Until the Other Plane is Flying Steadily About Eight Feet Directly beneath Him, When He Hangs by His Hands, Lets Go—and There You Are

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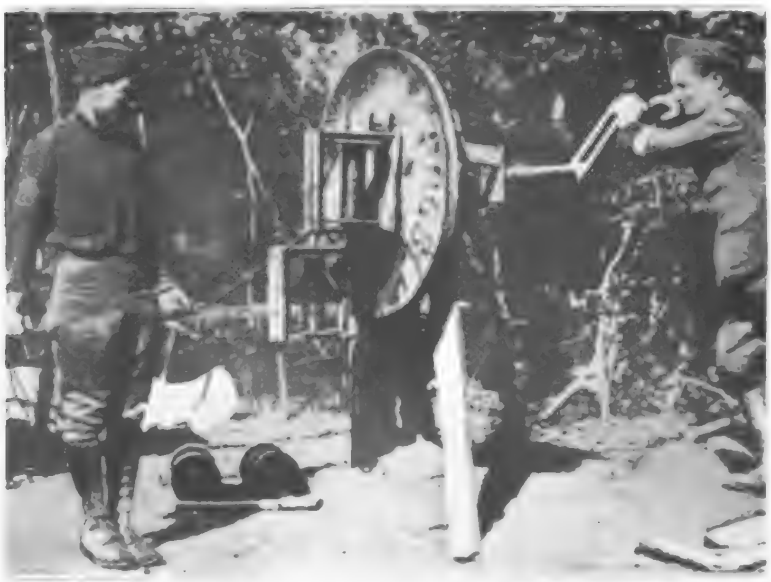
## IMPROVISED WIRE TWISTER BUILT UNDER FIRE

The policy of the American army, which trained every man to think and act for himself in an individual emergency, was vindicated again and again under fire. The wire twister in the illustration, for example, was built from odds and ends by men of the Signal Corps during the St. Mihiel action. It was just part of the day's work, but it probably saved its quota of American lives.



PHOTOGRAPH BY SIGNAL CORPS, U. S. A.

**American Brains Got Busy When a Detail from the Signal Corps was Ordered to String Twisted Wires along the Trees during the St. Mihiel Drive. This Crude but Effective Wire Twister Was the Result**

## BRITISH COMPANIES PREPARE FOR AVIATION INSURANCE

More than a score of the leading British insurance companies are interested in a comprehensive scheme for aviation insurance. Four classes of risks will be provided for: damage to machines; accident to pilots and passengers; loss of or damage to goods in transit, and injury to the public or to public property. The companies are sure that large policies will be taken out as a consequence of the great size of many ships now building, and are therefore prepared to pool their enormous resources in order to offer any security desired, or to cover any possible loss.

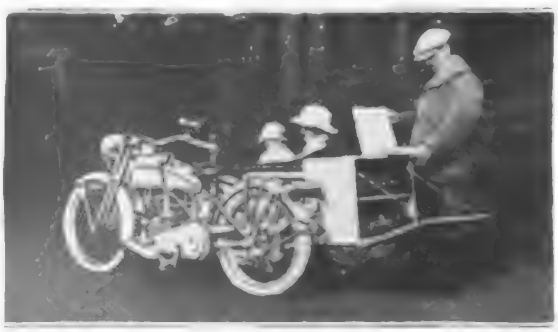
¶A mid-western city will hereafter name each new concrete bridge in honor of some local hero who lost his life in France.

## RADIATION FROM FINGER TIPS DECLARED A FACT

Experiments with a supposed radiation or effluence from the human body have been conducted by a Swedish psychologist with graphic results. The effluence, flowing most readily from the finger tips, is said to cause actual nervous sensation and even muscular contraction on the body areas experimented with. The scientist has gone farther, too, by handling the body emanation almost like an electric current. Thus, he finds that the odd radiation passes through glass or metal, but seems to be arrested by cardboard or wool; he reflects it against a sheet of metal, and even conducts it along a rod bent at right angles. His work seems to discredit the skeptics, who have long scoffed at the hypnotist's mysterious "passes" over his subject.

## LUGGAGE CARRIER ON SIDECAR INCREASES TOURING COMFORT

The addition of a capacious luggage carrier to the rear of his sidecar has enabled one motorcyclist to tour en famille with complete comfort. The idea is a good one and well worth the attention of those who enjoy extended sidecar trips.



**By Adding This Luggage Carrier to His Equipment the Motorcyclist has Considerably Increased Touring Comfort. An Auxiliary Set of Springs Carries the Extra Load**

To permit heavy loading, in this case, the sidecar suspension was reinforced with a set of six-leaf cantilever springs.

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## AIRPLANE HELPS ARCHITECT PICK SITE FOR VILLA

A Florida architect was recently commissioned by a client to select the most desirable location for a seaside villa. He investigated, and found that the client's property stretched inland from the ocean beach, but was so marshy and overgrown with vines and creepers as to be quite impenetrable. As there were no tall trees to climb, the architect returned to town, hired an airplane and pilot, and flew back and forth over the property until he had picked the site.

## STEEL CYLINDER PROTECTS HOSE ON STEAM ROLLER

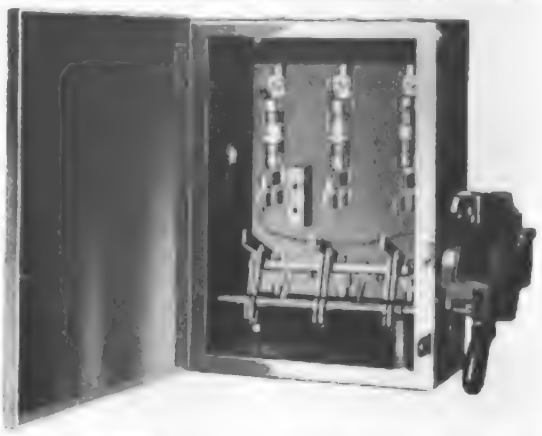
As a city ordinance prohibits parking within 25 ft. of a fire hydrant, the street department of Oakland, Calif., has equipped its steam roller with a 50-ft. length of hose for filling and washing the boiler. For convenience, it is carried at the rear of the machine on a reel, which is inclosed in a steel cylinder. The upper

**For Filling and Cleaning the Boiler This Steam Roller Carries a 50-Foot Hose Which is Guarded by the Cylinder, Shown Open in the Picture**

section of the cylinder is hinged to form a lid, which may be padlocked for protection against thieves.

## STARTING SWITCH PROTECTS BOTH MAN AND MOTOR

A motor-starting switch recently put on the market secures the safety of both man and machine. The operator is protected by a lock which will not permit the switches to be thrown unintentionally when the door is open, thus eliminating the common danger of shocks and burns. The motor is guarded by a coil, which releases a catch when the voltage drops to the danger point, thus allowing a heavy spring to open the switches. Another feature is the arrangement of contacts by which the blades do not leave the starting

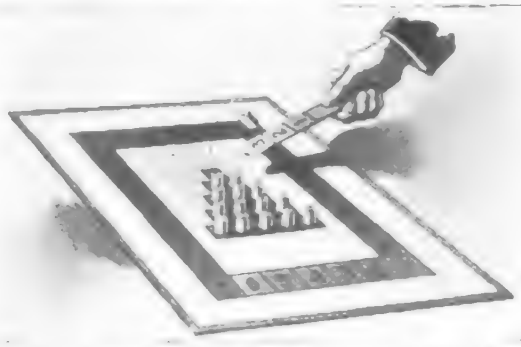


**Workmen are Protected from Shocks and Burns by This Motor-Starting Switch, Which can be Thrown Only When the Steel Door is Closed**

position until they have entered the running position, thus avoiding an "arc" at this point in the operation.

## NEW GAME OF JUMPING BLOCKS DEMANDS SKILL—AND LUCK

Moving the pieces, or "men," by pressing a small paddle on their upper edges, is the feature of a new game of skill. The 15 men, of about the same height as diameter, bear numbers on both top and bottom whose sum is 31. A triangle of 15 one-inch squares, numbered 1 to 15, occupies the center of the board, surrounded by a border of 28 two-inch squares, numbered 1 to 14 and 17 to 30. Spaces on the paddle are also numbered 3, 2, and 1. The player may jump the man he selects either onto the paddle or into the border square whose number corresponds to one of the marks on the piece. The various combinations of numbers thus obtained have different values.



**In This Game the Pieces, Numbered on Both Sides and Occupying Numbered Squares, are Jumped to New Positions with a Paddle**

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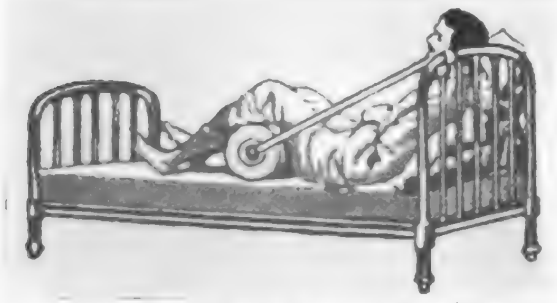
## SMALL BOLSTER BRINGS EASE TO BEDRIDDEN PATIENTS

In hospital practice it is often desirable to maintain a patient in a sitting or semi-reclining posture. In cases of extreme weakness, the patient has heretofore been supported in this position by any means that came to hand; but there is now on the market a small bolster designed for this very purpose. It is essentially an enameled cylinder, covered with a hair mattress and pillow slip, and firmly held beneath the patient's thighs by two canvas strips attached to the head of the bed.



This Little Metal Bolster should Save Hospital Attendants Much Effort in Maintaining a Patient in Any Desired Position

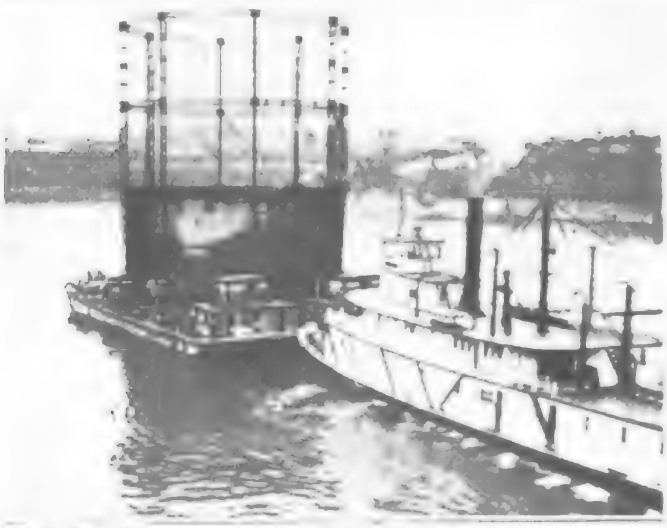
## TRACTORS GO TO PRIBILOF ISLANDS TO HAUL BONES

The discovery of a deposit of fossil seal bones in the Pribilof Islands, off the southwest coast of Alaska, has resulted in complete plans for its exploitation. Four track-laying tractors will haul the bones over the deep sands of the islands to the grinder, already installed, which will prepare the material for market. The find should pay well, as the stuff will be brought to the United States as ballast in the hulls of returning government boats.

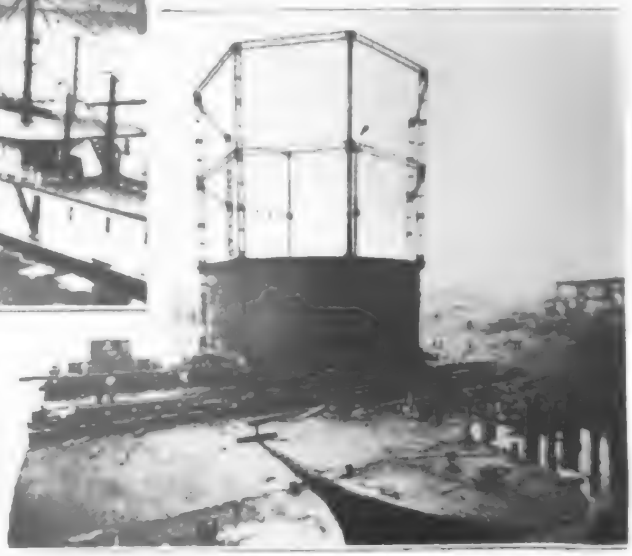
◖A skater in Stockholm, Sweden, has established a world's record by traveling 10 miles in 31 min. 7½ seconds.

## TOW HUGE GAS TANK UP RIVER ON RAFT OF TWO BARGES

Most adaptable of transportation routes, the larger waterways often bear strange burdens. Up the Willamette River, in Oregon, not long ago an energetic tug towed a huge raft made by tying two big river barges side by side. On the improvised float rested a gas holder 67 ft. in diameter, towering approximately 100 ft. above the water. The 250-ton tank was moved over beams and rollers from the gas plant at Portland onto the barges, floated 1½ miles, unloaded by the same process, and moved overland 1,000 ft. or more. It was finally installed in a shipyard, whose huge consumption of gas had made a local tank necessary.



Huge Gas Holder being Towed Up River on Its Two-Barge Raft. In This Position Its Framework Towered a Hundred Feet above the Surface



Illustrating the Somewhat Ticklish Task of Loading the Tank onto the Raft, by Means of Heavy Beams and Rollers

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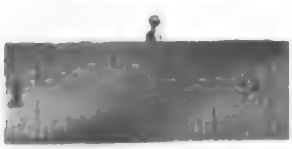
## IMPERVIOUS CONCRETE MADE BY NEW ENGLISH PROCESS

By admixing a liquid of secret formula to the water used in mixing concrete, an English inventor evolves a product impervious to moisture. The new ingredient is asserted also to strengthen the adhesion of the concrete to its reinforcing members, to increase its density, and accelerate its setting. Tests of such concrete indicated a tensile strength 12½ to 15 per cent greater than that of ordinary concrete: compression strength 33 per cent greater, and complete imporosity after drying. A porous brick took up 1 lb. 12¾ oz. of the preparation, was dried for 48 hours, and then failed in 15 minutes to absorb any water whatever. The prepared concrete is affected by nitric, hydrochloric, and acetic acids, but not by the strongest sulphuric. This suggests for it a possible place in the chemical industries, as for sulphating tanks. The liquid also finds a use for treating timber, and is declared to harden it and render it fire and water-proof.

## TINY TURBINE ENGINE NO LARGER THAN PINHEAD

The man who built what is reputed to be the smallest electric motor and the smallest steam engine in the world has now completed a turbine engine, weighing only 12 milligrams (not quite two-tenths of a grain), and in size about as large as an ordinary pinhead. The steel rotor, or revolving part, is .032 in. in diameter, and has six slots. The case is made of gold. As steam is too heavy for the tiny mechanism, the turbine is run by air injected through the hollow base. The little engine is shown in actual size.



## HUGE COLORED PHOTOGRAPHS ILLUSTRATE WAR WORK

By means of an exhibition of enormous enlarged photographs the British public is now learning more of the gallant work done by its Royal Air Force during the war, in France and half a dozen other lands. It is hoped that the display may later reach the galleries of the United States and Canada. In addition to the work of enlargement, the photographs have been appropriately colored with the air brush.

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**To Enable Her to Color All Parts of the Enlarged Photograph, This Girl was Suspended from the Rafters of the Studio. The Photograph Is One of Many Illustrating the Work of the British Air Service**

## CENTRAL ICE PLANT SUPPLIES FRESH BEEF TO A. E. F.

The inhabitants of a muddy little town near the headquarters of the Service of Supply, A. E. F., had never heard of water being frozen in the summer time, until an American engineering regiment came to town. Directing the work of thousands of labor troops, the regiment constructed a great refrigerating plant that supplies the whole expeditionary force with fresh beef. It is stated that no other army on the continent is thus supplied from one central plant.

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The Children, Ranging in Age from Four Years to 14, Go through Their Daily Exercises on the Upper Decks of New York City's "Day Camps," Two of Which Now Accommodate About 475 Children, Out of an Estimated 216,000 Who Need Attention Because of Undernourishment. A Physician and Three Nurses Direct the Work

# FLOATING PREVENTORIUMS

By WILLIAM D. GOODWIN

THERE are in the city of New York 216,000 children between the ages of four and sixteen who are undernourished, according to a recent report upon the subject.

For the benefit of such children, suffering from malnutrition, the Department of Health in that city has established so-called "preventoriums"; one known as Day Camp Manhattan, at the foot of East 90th Street, the other, Day Camp Rutherford, at the foot of North Second Street, Brooklyn. These are experimental stations where the effort is being made—and with marked success—to show how children, who might later fall a ready prey to tuberculosis, can be fortified against that and other diseases.

This Is "Day Camp Manhattan," an Old Ferryboat Remodeled and Moored to a Dock in the East River. At the Center of the Lower Deck Is the Kitchen, and at Its Left the Room of the Nurse in Charge, and Her Assistant

In casting about for locations for such purposes, old ferryboats, which had seen better days, were remodeled and moored at the docks on the East River. While, at present, only about 475 children can be accommodated at these two camps, it is hoped later on to establish other camps of a more permanent nature, where children may be cared for both night and day.

Both camps are equipped with schoolrooms, playrooms, a kitchen, dining rooms, shower bath, and a dental clinic. The public schools, clinics, and charitable organizations, each furnish their quota of children who attend the camps. Weather permitting, all the school duties — which are directed by three teachers at each camp— exercises and games are enjoyed in the open air. All the children are under the careful supervision of a physician and three nurses. At least once a week each child is weighed, and a record is kept. Their teeth are carefully attended to, and other physical defects, such



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graduates from the camp healthy and well, and educated in sane methods of hygienic living.

The camps are open all the year, making it possible for many children to become healthy, physically and mentally, while the knowledge they obtain is carried to the parents, to enable them to attack and obviate preventable disease. Perhaps the most valuable feature of these camps is that they apply a new method of preventing tuberculosis, namely, to attack the problem at its root by building up the powers of resistance in children whose constitution would otherwise favor development of that plague.

## SHIP RAISED BY LOCOMOTIVES WHILE FLIER TAKES PHOTO

Five powerful locomotives performed an engineering feat of unusual character when they were used, after a recent accident at a British dock, to raise a capsized ship. A transport had caught fire at the dock, and burned so fiercely that its officers were forced to scuttle it. In sinking, it turned over on its side, from which position the locomotives hauled it back to normal with cables.

**View Taken from an Airplane of an Unusual Feat in Ship-Raising: A British Transport, Burning at the Dock, had Turned Over in Sinking, and was Righted by Five Railroad Locomotives Hitched to It with Cables. The Vessel at the Right Is the Salvage Ship**

¶A "thirst cigaret," devised by a Swiss inventor, is the latest provision against drought. It will not alleviate the July aridity in this country, however, being merely a tube containing a compound of licorice, citric acid, sugar, water, and amyl acetate. Held in the mouth, it allays thirst when water is not available.

## PROMENADE DECK FEATURE OF RUSSIAN AIRPLANE

Russia's foremost aeronautical engineer, M. Sikorsky, has arrived from overseas to announce that he will place on the American market a large plane of his own design, intended for freight and passenger traffic. The designer constructed battle planes for Russia while she was at war with Germany, and since the spring of 1918 has been working for the French government, chiefly upon the model which he now presents for commercial use. The craft has a wing spread of 115 ft., a length of 87 ft., and is driven by four motors at an average speed of 90 miles an hour. Exclusive of the crew of six, the body accommodates 32 passengers, who can watch the scenery slide by through observation windows and the glass floor. For the more adventurous, the inventor has even provided a promenade deck along the lower wings. Electric light, heat from the exhaust gases, a kitchen, a luggage room, and a lavatory assure additional comfort.

## BEAN FROM CLIFF DWELLING SPROUTS LIKE ANY OTHER

During a vacation trip among the crumbling cliff dwellings of Arizona, it was one man's good fortune to stumble upon a small cave, hitherto unopened. Dislodging the bowlders that had blocked the entrance for quiet centuries, he was greeted by the customary sitting skeletons. His really important find, however, was made when he pried off a slab of

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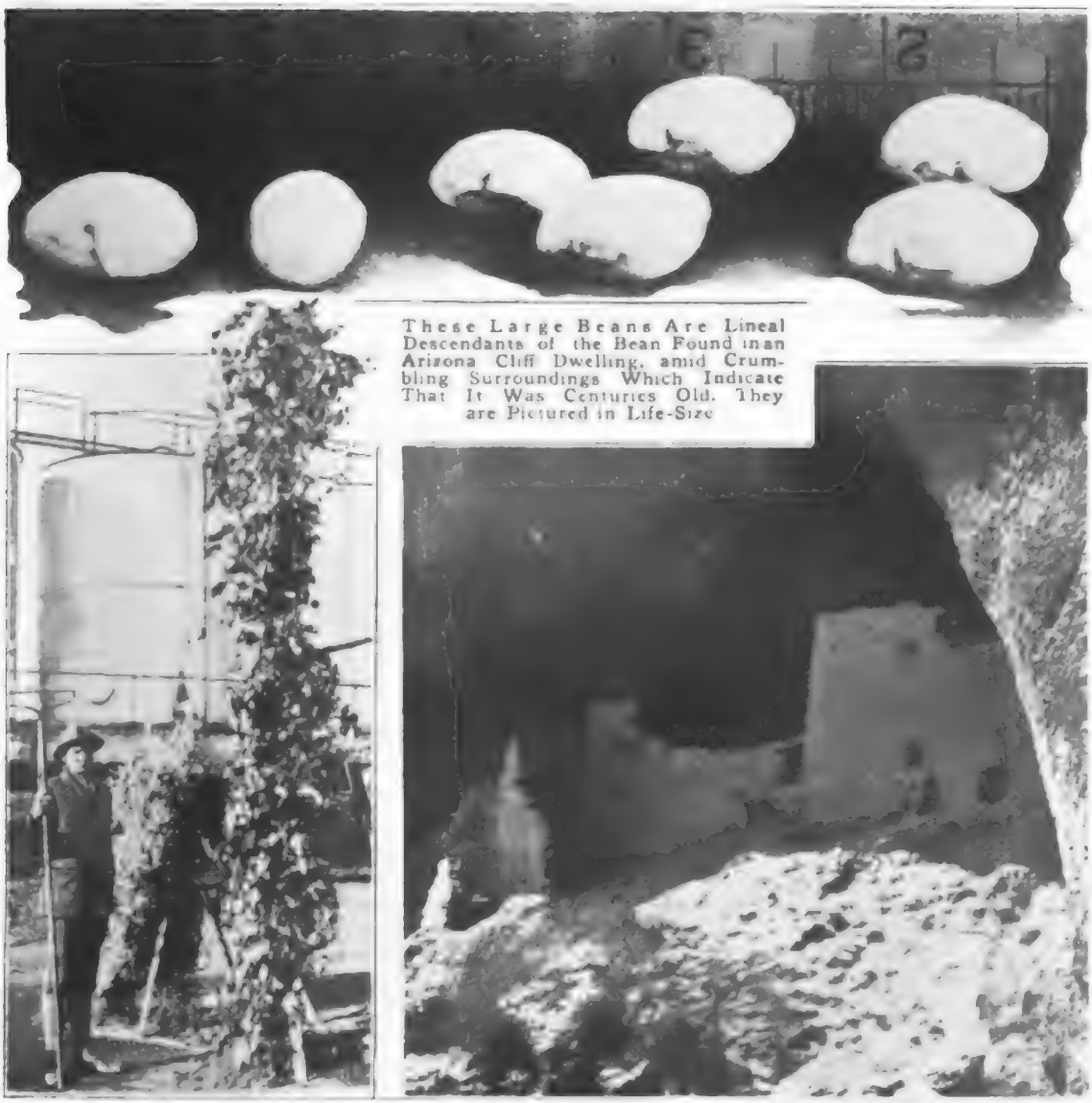

These Large Beans Are Lineal Descendants of the Bean Found in an Arizona Cliff Dwelling, amid Crumbling Surroundings Which Indicate That It Was Centuries Old. They are Pictured in Life-Size

PHOTOS BY COURTESY OF STANDARD OIL BULLETIN

**The Lucky Discoverer of the Prehistoric Bean is Shown at the Left beside the Plant Which He was Able to Grow from It. A Well-Sealed Niche in a Cliff Dwelling, Like the One at the Right, Yielded the Strange Link with America's Unrecorded Past**

rock that sealed a pocket in the wall. He found beans. They were fine, large beans, too, all clinging together in a solid mass that seemed to indicate the decay of the receptacle that once had held them. At his touch all disintegrated save two. These he carefully pocketed, carried to his home, and planted. One grew, and is said to be today the ancestor of big, healthy beans that are declared by many seedmen to be of a new variety.

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¶ It is announced that all citizens who have not exercised homestead rights elsewhere in the United States since July 8, 1916, are eligible to file on homesteads in Alaska.

## BARGES FOR ATLANTIC COAST BUILT IN QUINCY, ILLINOIS

The contractors, at Quincy, Ill., who built 10 coaling barges for the United States Navy, are proud of their achievement. Theirs was the first government shipbuilding contract to go to a city on the upper Mississippi, and they feel that the barges should prove to the whole nation the value of the river cities as potential shipbuilding centers. The vessels are a genuine product of the river states, as both workmen and material came from the valley, while power from the great Keokuk dam drove the compressed-air boring and riveting machines.

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## TURN ON WINDLASS DRAINS FISHERMAN'S CATCH

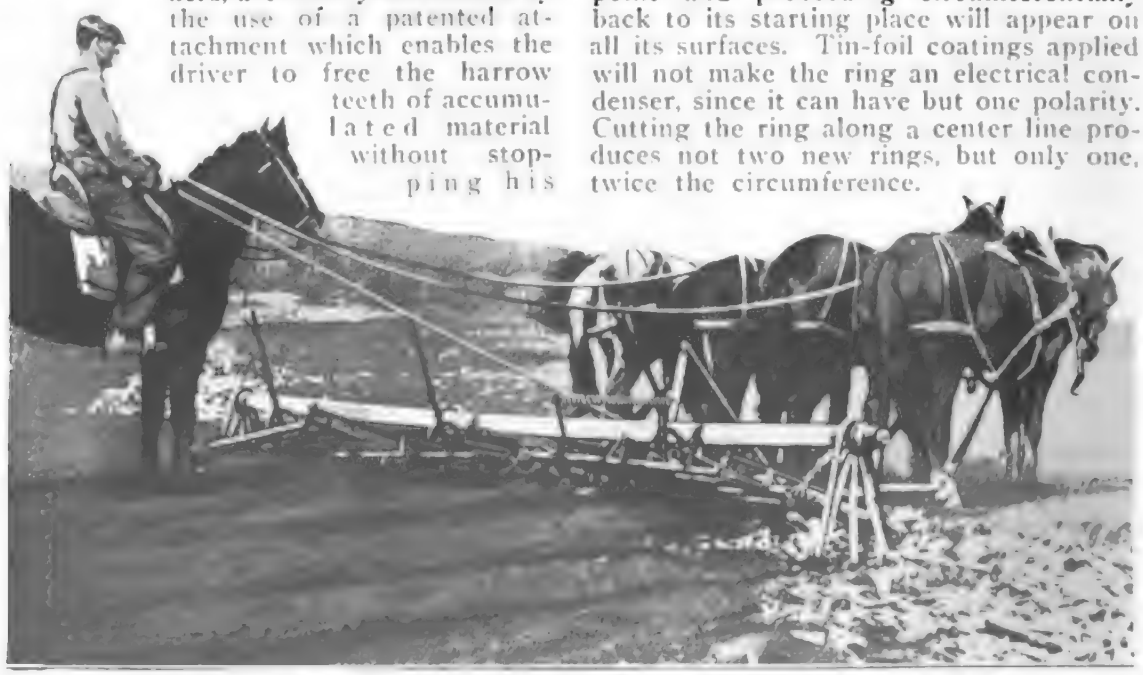
The little landing stage illustrated in the photograph has two merits that recommend it to local fishermen. The first is the hand windlass that lowers and raises the platform with the ebb and flow of the tide; the other is the screen-bottomed box, or well, which is fastened to the staging, and may thus be lowered into the water to keep the catch fresh and lively, or may be raised and drained to permit the fisherman to string his catch at the end of the day.

## ATTACHMENT SAVES TIME IN CLEANING HARROW

Delays caused by the necessity of stopping to clean harrows while cultivating a field, are wholly eliminated by the use of a patented attachment which enables the driver to free the harrow teeth of accumulated material without stopping his horses. Mounted transversely on suitable brackets above the implement is a wooden shaft with a segment of a wheel at either end. Normally these segments extend toward the rear. When the harrow is to be cleaned the driver pulls a cord connected with a lever having a pawl that engages a ratchet on the shaft. This turns the latter on its axis, swinging the segments forward. As the implement moves along, the segments swing under the shaft, lifting the harrow and allowing the débris to fall from the teeth before they again strike the soil.

## OBJECT WITH ONLY ONE SIDE IS MATHEMATICAL NOVELTY

A sheet of paper with only one side might well head a list of obvious impossibilities. Yet mathematicians of late have been studying an arrangement which, from the scientific standpoint at least, is just that. The demonstration is simply a strip of paper given a half twist and then joined at the ends into a ring. Such a ring has no definite inner and outer surfaces; they are both the same. A pencil mark started at any point and proceeding circumferentially back to its starting place will appear on all its surfaces. Tin-foil coatings applied will not make the ring an electrical condenser, since it can have but one polarity. Cutting the ring along a center line produces not two new rings, but only one, twice the circumference.



**Harrow Equipped with an Attachment Which Cleans the Teeth of Débris Automatically: The Segments of Wheels are Here Shown Lifting the Implement off the Ground, so That the Accumulated Matter will Fall Away and be Left Behind**

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## CRYSTAL-SURFACE EFFECT WITH NEW LACQUER

Surfaces with a rough, crystalline effect are produced on metal by the use of a new lacquer. The crystals develop about eight hours after the coating is applied, by spraying or dipping, and are coarse or fine as the application is heavy or thin, the crystallizing process being completed in 24 hours. Old methods of mixing sand with the lacquer, or sprinkling it on the wet coat, were objectionable because the finish wore off, dimmed the color, or was not uniform. The new process is declared completely to overcome these defects, and to afford a finish as durable as that of any lacquer, with the full color value retained.

## VIADUCT CARRIES TRAVELERS OVER WATER-FRONT TRAFFIC

Throughout the day the doors of a busy San Francisco ferry terminal used to discharge crowds of travelers into the swirl of water-front traffic. This condition was not only an inconvenience to everyone, but a positive danger to pedestrians; so, to banish it, a steel viaduct, or footbridge, has been built by order of the State Board of Harbor Commissioners, which measures 393 ft. in length, 16 ft. in width, and clears the street by 22 feet. A hair-raising escape from the wheels of a motor truck no longer furnishes the stranger with his first impression of the town.

This Long Steel Viaduct Carries Travelers Safely from the Ferry Terminal over the Busy Water-Front Traffic. It Was the Only Solution for a Perplexing Traffic Problem

## ANCIENT TOWER MADE TO ORDER FOR AMERICAN

That his country home at Coucy-le-Chateau, France, might be in completer harmony with its setting, an American recently decided to add to it a massive tower modeled after another in the neighborhood. His architect studied the model in detail, and was able to furnish him with a weather-scarred old pile that makes the oldest inhabitant rub his eyes. From the great beamed library, in the heart of the structure, winding stairways lead the surprised visitor to a sunlit garden on the roof, which yields a pleasant view of tilled and wooded countryside.

This Seemingly Venerable Tower, Topped with Shrubs and Flowers, was Built Only Recently by an American in Imitation of an Authentic Structure in the Neighborhood. The Details are Correct, Even to the Pitted Walls and the Winding Stairways

## CEMENT CONTAINING GYPSUM GOOD FOR MARINE WORK

In the course of construction work around the Black and Azov seas, Russian engineers have found that cement made from slag, with a properly related proportion of gypsum, is quite satisfactory for bridge piers, docks, tanks, and other marine work. No swelling, cracking, or distortion occurred when 10 to 15 per cent of gypsum was used. A granulated slag-lime-gypsum cement developed in this work offers opportunity to put to good use some of the accumulated slag of war industries. When gypsum cement has proven unreliable as to volume, the reason is declared to be an improper ratio of gypsum to lime.

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## HIDEOUS IRON MASKS GUARDED CREWS OF FRENCH TANKS

The crews of the French tanks, who fought beside the Americans in the Argonne, were sometimes supplied with iron face masks, as in the illustration. They were rather hideous in appearance, but often proved a real protection against the flying shell splinters which inevitably penetrated the narrow slits which permitted observation by gunner and driver.

## HOTEL FOR CHATEAU-THIERRY NEW MECCA OF TOURISTS

An American hotel, to be one of the largest in France, is planned for Chateau-Thierry. The famous scene of Franco-American triumph is expected to become a mecca for literal hordes of tourists, whose interest is not likely to abate for years to come. Increasing industrial activities already are crying for accommodations, which a syndicate backed by New York and Paris capital promises to supply, under the management of an American hotel man.

## CONVENIENT TRAY SPEEDS UP MACHINE BOOKKEEPING

The requirements of modern, high-speed machine bookkeeping have developed several different trays that keep ledgers in good order when not in use, but are intended primarily to permit rapid fingering of the sheets, or cards, by the operator. The machine illustrated is built entirely of steel, and is designed for quick manipulation of the various parts. Thus, to commence posting, the operator inclines the back plate to allow the sheets to slope back, pulls a small lever to release the sheets, inclines the front plate, and throws over a second lever, which raises a "hump" at any point on the tray bottom. This last feature tilts the sheets to give additional ease in fingering.

## REAL GOLDEN APPLE IS GIRL'S BEAUTY PRIZE

Eris, Greek goddess of discord, originated the custom of conferring a golden apple upon the most beautiful goddess. But there was no discord when a three-hundred-dollar apple of 14-ct. gold, designed by famous jewelers, was given to the most beautiful girl at a fraternal-society ball in Washington, D. C. The unusual prize was a graceful acknowledgment of the poesy of mythological legend.

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## SMALLEST MACHINE SHOP BIG HELP IN WAR

Out from under the censorial lid that lifted with war's termination are filtering many curious facts. Not the least interesting of these revelations concerns a machine shop, probably the tiniest that ever boasted a building of its own. In this miniature plant, 18 by 12 ft., and 8 ft. high, were crowded six, and often more, expert toolmakers, who labored and perspired over war contracts throughout the 24 hours. The little shop was located in a Brooklyn back yard, behind an ordinary duplex house. It was erected on its concrete base in "knock-down" style, its 46 parts assembled by the hand of its owner, himself a toolmaker and inventor. Ten machines, driven by electric power, executed here an astonishing volume of work of such extreme precision that no rejections, it is positively declared, ever were recorded against the product. An accuracy of .0002 in. was habitually observed in the gauges and tools manufactured under unusual pressure. An amusing incident of the shop's history was the objection voiced by neighbors to its nocturnal activities, and the consequent suggestion of government officials that the neighbors "take rooms elsewhere."

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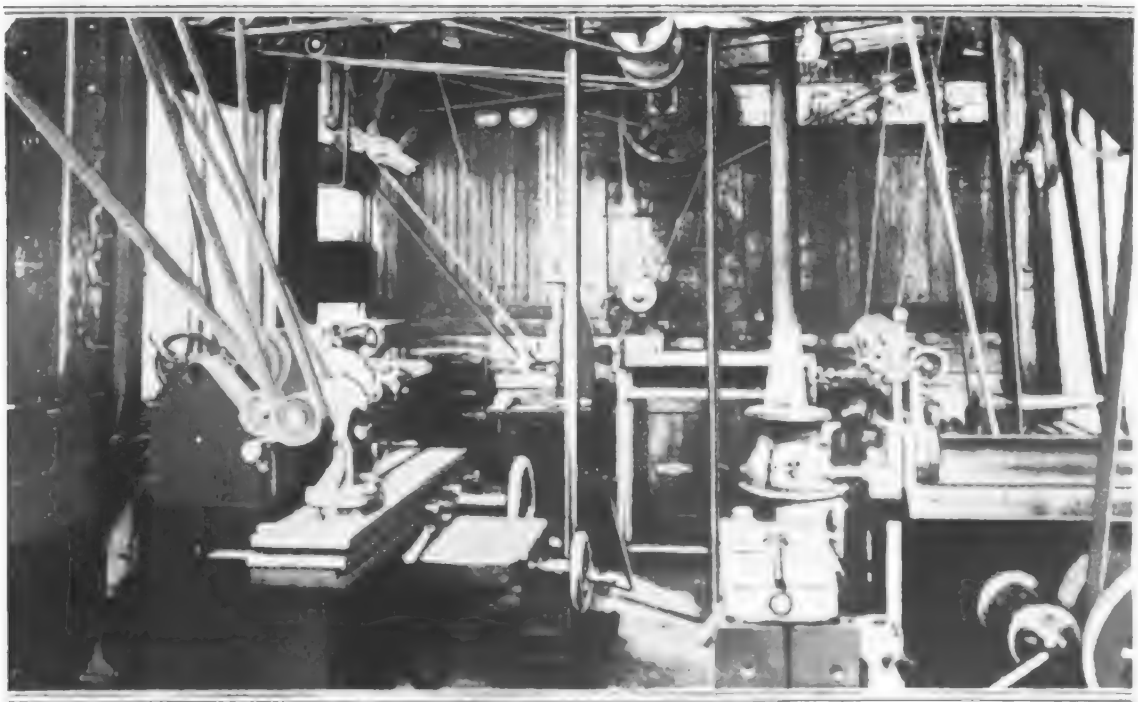
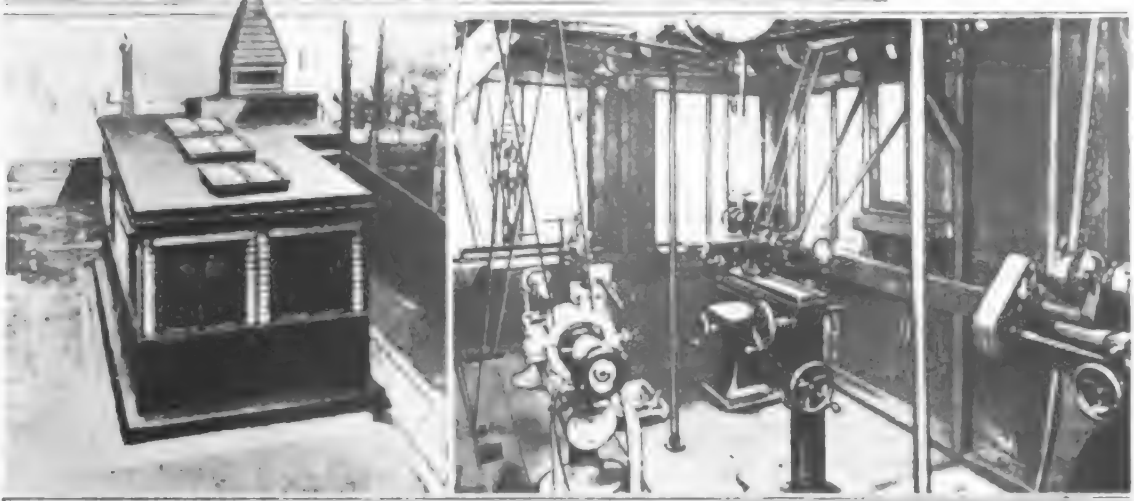


The Busiest Corner of the Busiest and Smallest Machine Shop, Where, during the Last Part of the War, Precision Machines Almost Rubbed Elbows 24 Hours of the Day, with a Record of No Rejections for Their Product of Special Tools and Gauges

These Toolmakers' Benches Found Space, Along with Ten Machines, on the 12 by 18-Foot Floor of the Tiny Shop—to Say Nothing of the Six or More Expert Toolmakers



The Shop Building Itself, in All Its Eight Feet of Height and 216 Square Feet of Ground Space, is Seen at the Left, Occupying Its Site in the Back Yard of a Brooklyn Dwelling. The Right-Hand View Gives a Fair Idea of the Clustering Arrangement of Machines on the Parlor-Sized Floor



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## SIGHT-SEERS' GLASS-TOP BUS GIVES ALL-AROUND VIEW

Tall monuments and public buildings in Washington, D. C., may be viewed by travelers in sight-seeing busses without sticking their heads out of the windows. On one of these bus lines the roofs of the cars are made of thick, clear plate glass, reinforced by fine wire netting of wide mesh. The glass is set with rubber composition in a channel-iron frame, so the roof is leak proof.

The Roof of This Bus being Made of Glass, Its Passengers can See All the Sights of Washington, D. C., without Endangering Their Heads

As may be Seen, the View through the Glass Top is Unobstructed. The Panes are Reinforced by Fine Wire of Large Mesh, and Set in Rubber Composition to Make Them Leak Proof

## FATHER OF THE TYPEWRITER BORN 100 YEARS AGO

A movement to erect a shaft to the memory of Christopher Latham Sholes recalls that he died in 1890, hailed by many as the "Father of the Typewriter." Although the idea of the typewriter is at least two centuries old, a British patent being granted in 1714 for an "Artificial Machine for Impressing Letters," yet it seems certain that the American was responsible for the first commercially practical machine. Years of experience as an editor showed him the need of a "writing machine," and in 1867 he fashioned a crude affair of pine wood, glass, an old telegraph key, and carbon paper, that was held in the hand of the operator. The machine had other limitations, too, as it would print only the letter "W." Yet the construction was fundamentally good, and in 1874, a machine appeared on the market, to be improved year by year until the present commodity resulted.

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As another item in her publicity campaign, Alaska will soon ship to the States 10,000 ft. of motion-picture film illustrating Alaskan life and scenery.

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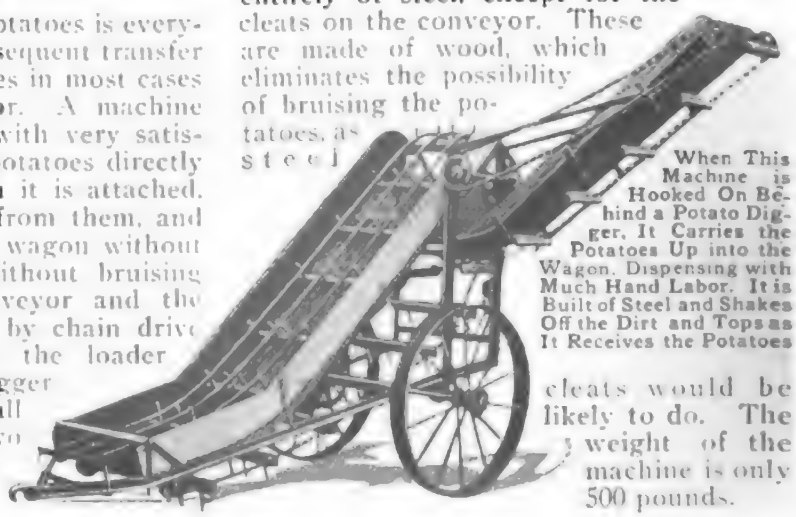
## POTATO LOADER CARRIES CROP FROM DIGGER TO WAGON

Mechanical digging of potatoes is everyday practice, but their subsequent transfer to the wagon box continues in most cases to be done by hand labor. A machine that is coming into use with very satisfactory results takes the potatoes directly from the digger, to which it is attached, shakes the tops and dirt from them, and conveys them up into the wagon without manual assistance and without bruising them. The inclined conveyor and the shaker bars are operated by chain drive from the wheel hub as the loader moves along behind the digger. The tops, shaken loose, fall to the ground. Only two men are needed, one to run the digger and one on the wagon, the loader itself requiring no special attention. The machine is built entirely of steel, except for the cleats on the conveyor. These are made of wood, which eliminates the possibility of bruising the potatoes, as steel cleats would be likely to do. The weight of the machine is only 500 pounds.



When This Machine is Hooked On Behind a Potato Digger, It Carries the Potatoes Up into the Wagon, Dispensing with Much Hand Labor. It is Built of Steel and Shakes Off the Dirt and Tops as It Receives the Potatoes

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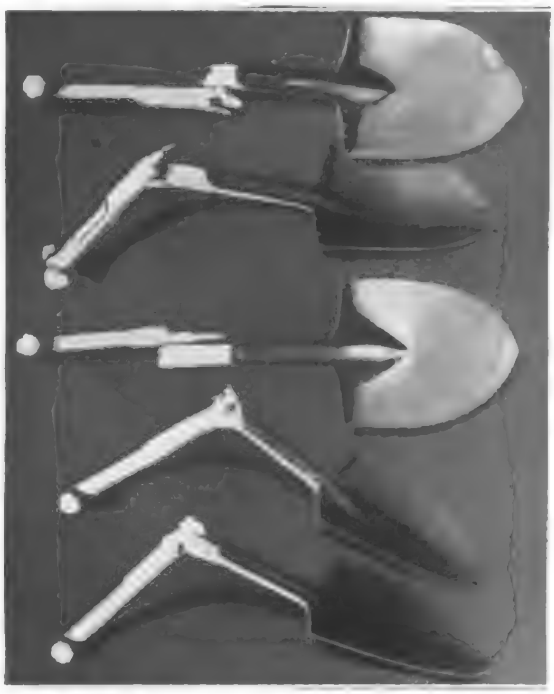
# DODGING FREAKS AND FLAWS IN WOOD

## How an Artificial Method of Wood Seasoning, Developed to Meet the Needs of War, Outdoes the Old Method of Weathering Stacks of Lumber

By BRANDON TRACY

ONE of the first official reports to the Department of Supply sent in from the Commander of the American Expeditionary Force in the Toul sector conveyed the following succinct information: ". . . . fourteen of the first thirty entrenching tools used proved defective. . . . ."

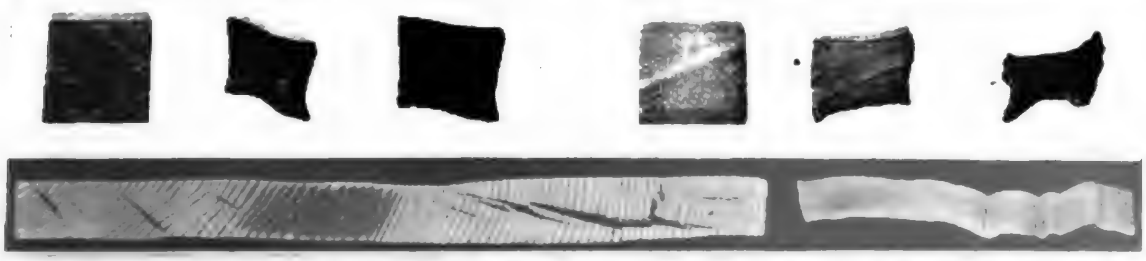
Stated briefly, when the soldiers carrying these short-handled spades attempted to use them for the purpose of "digging in," the handles broke! Since the entrenching tool finds its greatest utility at moments of life and death emergency — when burrowing in the earth is the only means of escaping the enemy's murderous enfilade — this was more than a serious fault. It was next door to criminal negligence on the part of the government which provides the defective implements. An investigation was started immediately.



Attempts to Season the Wood Rapidly Resulted in the Fracture of a Large Percentage of Entrenching-Tool Handles, Some of Which Broke Like This While Their Users were Literally Digging for Their Lives Amid a Storm of Machine-Gun Bullets

In those first months many other tools with long wooden handles failed to stand up in service. The Forest Products Laboratory of the United States Forest Service, which had the investigation in charge, found that the trouble lay entirely in the fact that the handles had been made from improperly oven-dried lumber. Manufacturers, face to face with an unprecedented demand for tool handles, had been compelled to give up using air-seasoned wood —little of any kind was left in the whole country — and accept an oven-dried product vastly inferior. This material, casehardened, checked, exploded, collapsed, and badly shrunk as it was, could do nothing but fail in the grand average of instances.

The Forest Products Laboratory, faced with the problem of working out a scheme for providing durable tool handles, joined this to two other similar problems, and solved the three at once. The other dilemmas had arisen in respect to spruce for airplanes and heavy oak stock for the rims of artillery wheels. There was no properly air-seasoned spruce or oak left in the United States: all had been gobbled up by the allies long before America joined them. The process of weathering takes from one to three years, depending on the size of



Utter Failure of the Fiber, Called "Collapse," and Caused by Improper Drying, is Shown in These Cross Sections. All the Upper Specimens Were Originally Four Inches Square, but Some Have Lost Surprisingly in Volume



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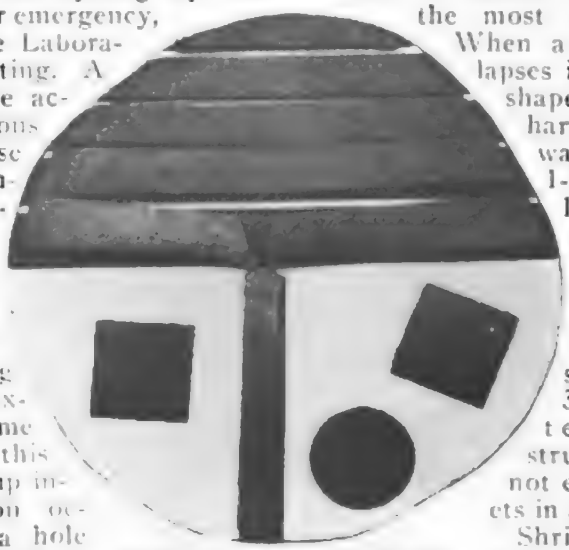
the stick desired, so this was out of the question. Mother Nature cannot be speeded, even by war.

An even dozen quack formulas for drying lumber, which had sprung up like mushrooms in the war emergency, were tried out at the Laboratory, and found wanting. A glance at some of the accompanying illustrations will show what these means for baking lumber to dryness accomplished. When some of the moisture, imprisoned in the middle of a board, was heated to the vaporizing point it naturally expanded. Then, if some means of egress for this vapor did not show up instantly, an explosion occurred. This tore a hole through the lumber fibers, making the stick entirely useless.



Shrinkage and Warping, Caused by Too Rapid Drying Outside While the Heart Retains Moisture, are Well Indicated in This Log-End View. The Center Stick has Wholly Failed at the Heart

Another mysterious flaw that developed is known as casehardening. Afflicted in this way, a stick warps so that it is concave on one side. This, of course, is caused by an outside drying while the heart still is wet; a tension, the nature of which still is a mystery to even wood specialists, develops which pulls the stick all out of shape and spoils its strength utterly.

What is called "collapse" is probably the most total failure of all. When a plank of wood collapses it loses all its original shape, and seems to case-harden several different ways at once. A straight 1-in. board may look like a rumpled rug after this has happened. A great deal of the original volume is lost and so much of the strength with it, that 3-in. spruce sticks intended for airplane struts or I-beams could not even be used for pickets in a fence, after collapse.

Shrinkage and checking, which are the two main faults that show up in fine oak when improperly dried, simply are the results of taking a high percentage of moisture content away from wood too quickly. How this affects the use of the wood is demonstrated well by the process of steam-bending artillery wheel rims. The heavy stock is supposed to bend readily into a semicircle, and two of these semicircles of oak make a single rim. In practice, with the oven-dried product, between 70 and 80 per cent of these oak sticks broke instead of bending. The loss in money and time was enormous, and it looked as if steel or some other material would have to be tried out in the manufacture of wheels.

Bending an Oak Stick for the Wood Rim of an Artillery Wheel, the Wood First being Steamed in a Chamber or Soaked in Boiling Water: Seventy Per Cent of These Sticks Broke before the New Kiln was Used

A forest-products expert in charge of the department of timber physics solved the difficulty. He invented a water-spray, humidity-regulated dry kiln for use in seasoning lumber that not only has proved to be far better than any of the

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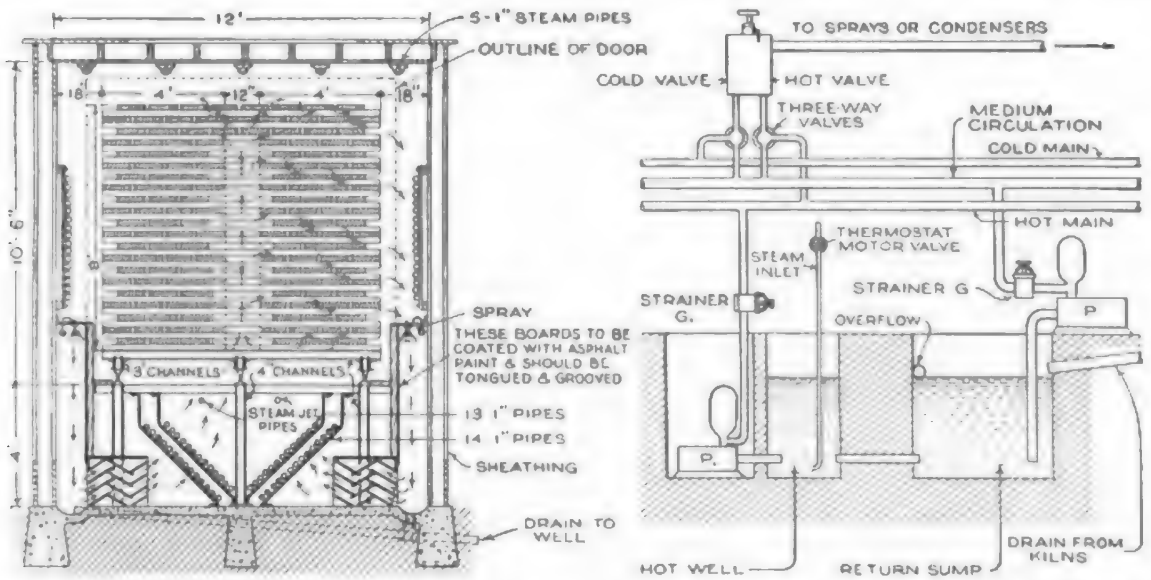
...ner kiln methods, but also that actually turns out far better results with most lumber than regular standard air seasoning. In from 10 to 20 days in the kiln, better Sitka spruce for airplanes, better northern oak for artillery rims, and better Douglas fir for tool handles is turned out by his new kiln than ever had been available previously.

The chief feature of this new kiln lies in the fact that the air that passes down through the lumber pile first has been through a water spray that has given it exactly the humidity desired. To the layman any humidity at all in a dry kiln sounds queer, but it was exactly in this point that the new device surpassed all others. When lumber with a green-wood moisture content of 40 per cent is put in this kiln, the spray provides 40 per cent humidity at the start. This is kept constant for a day, with the temperature and circulation of air regulated, and then the humidity of the air is dropped. Gradually the water is drawn from the lumber, and this occurs in such a way that the heart of the wood dries first. No collapse ever occurs, and the total of all the faults that do show up is less than 8 per cent of the total under the best of the old kiln systems, and 75 per cent of the total reached by the best air seasoning.

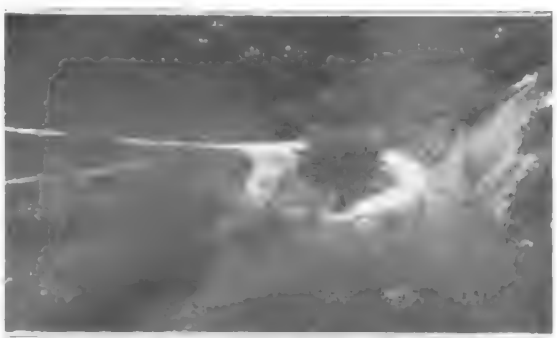
Now that the war is over, this kiln—patented in the name of the public—is at the disposal of anyone who desires to use it.




**The Water Sprays through Which the Air Must Pass Before It Reaches the Lumber, as Seen at the Left, Are the Secret of This Dry Kiln's Success. The Right-Hand Diagram Reveals the Method of Regulating the Humidity and Temperature as the Drying Process Progresses. The System, Invented by a Forest-Service Expert, Seasons Wood Thoroughly in 10 to 20 Days, with Results Better Than Air Seasoning**

## LOOP TURNS IMPROVE ROADS UP CATALINA'S MOUNTAINS

Roads that zigzag up steep mountain sides have a disconcerting way of suddenly reversing their direction as they stagger from one grade to another. On Santa Catalina Island, these reverse turns have been improved by adding to each of them a circular loop of roadway. This gives vehicles a chance to swing around into the new direction without coming to a stop; and it contributes a considerable factor of safety to the descent which may now be negotiated with less sudden application of the brakes.



**The Junction Point of the Two Roads Seen at the Left Made an Awkward Turn for Vehicles Until the Circular Loop of Roadway was Added; Now the Curve is Easily Negotiated Going Up, and Is Safer Coming Down**

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## STREET CAR ON A RAMPAGE ENTERS PRIVATE HOUSE

Out in Denver a common street car of an old and supposedly settled type became exhilarated by the keen mountain air to such a disorderly extent that it attempted to enter a private home on Tennyson Street. It passed the iron fence without trouble and crossed the yard, impatiently brushing aside trees and other obstacles. After demolishing the porch it was arrested by the inadequate size of the front door. The visitor was not hospitably received by the astonished family, who, as the door burst open, were confronted by the legend "Please Have Exact Fare Ready."

**It Was a Denver Street Car That Committed This Atrocity. After Jumping Its Track on Tennyson Street, It Smashed through the Iron Fence, Knocked Down a Tree, Wrecked the Porch, and Thrust Open the Front Door of This Private Home**

## NEW BATTLESHIP "TENNESSEE" IS AMERICA'S LARGEST

The American superdreadnaught "Tennessee," recently launched at the Brooklyn navy yard, is the largest battle cruiser, in point of tonnage, ever built in the United States. Its displacement is 32,300 tons. Of the same class as the "Idaho," its armament, twelve 14-in. guns, fires a broadside of 17,508 lb. of projectiles with a range exceeding 20 miles. More than 60 per cent completed at its launching, the "Tennessee" is expected to take its place in the line early in 1920. It is the third American fighting ship of that name, and for the ceremony of its christening the public was admitted to the navy yard for the first time since April, 1917.

## BARBED WIRE TO BE SALVAGED FROM BATTLE FIELDS

It has been estimated that 100,000 tons of barbed wire can be recovered from the battle fields of Flanders and northern France. As this material may command a price of perhaps $25 a ton, it seems that the British War Office Salvage Committee is wise in preparing an extensive reclamation program. The estimate appears very conservative, too, when it is known that America, alone, exported during the war more than 1,000,000 tons. The British committee is said to have ordered 40 outfits for this work, each unit carried in a motor truck and trailer. The tangled wire will be caught by a number of grappling hooks, and drawn by a steel cable and winch between two sets of rollers. The salvaged material will emerge from this process in the form of blocks weighing from 70 to 80 lb. each.

## SMOKE BARRAGE THRILLS PUBLIC IN MIMIC WAR

In many of its public exhibitions of war material the government has displayed everything from a hand grenade

**The Soldier is Demonstrating the Action of the Smoke-Screen Apparatus Used in Masking an Attack**

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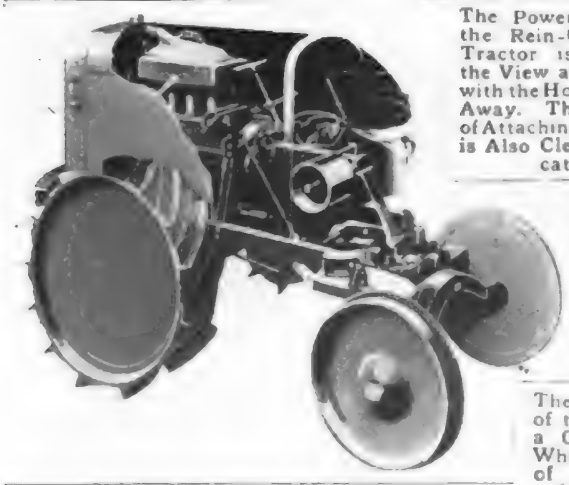
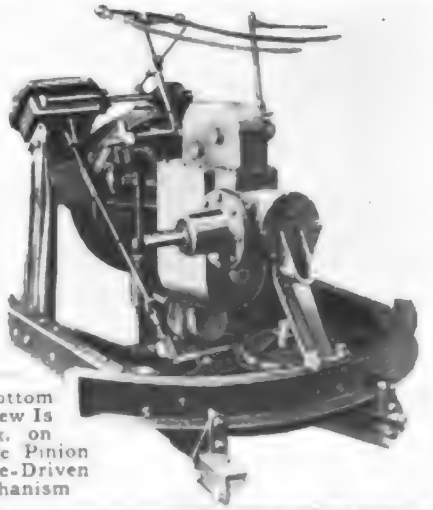


The Power Plant of the Rein-Controlled Tractor is Seen in the View at the Left, with the Hood Broken Away. The Method of Attaching the Reins is Also Clearly Indicated



The Arc at the Bottom of the Right View Is a Curved Rack, on Which Runs the Pinion of the Engine-Driven Steering Mechanism

**The Rein-Controlled Tractor in Demonstration: The Tractor Itself is Unoccupied, the Single Operator Sitting upon the Implement Which is being Hauled, and Doing All the Work of Starting, Steering, Stopping, Changing Speed, and Shifting Gears by Manipulating the Three Reins, Which, of Course, may be of Any Length**

to a 12-in. howitzer or a tank. An attempt is often made to thrill the spectators with a simulation of battle conditions, too, as with the smoke-cloud apparatus which was used to mask an attack. The contrivance resembles the liquid fire and other units which are carried complete by a single soldier, in order to secure the greatest mobility in the use of these effective weapons.

## NEW JOBS FOR ONE-ARMED MEN IN SIGNAL TOWERS

So many European railroad men have lost an arm during the war that it is now found necessary to assign them to jobs hitherto regarded as unsuitable. The signal tower in the railroad yard is a typical case. Here a treadle is so fitted to the big levers that the foot does the heavy work while the arm simply guides the movement.

## IMPROVEMENTS IN REIN-DRIVE SYSTEM FOR FARM TRACTORS

Efforts to dispense with the extra man required for many tractor-farming operations have produced several mechanisms for performing with horse reins all of the operations necessary to control of the tractor. A 3,200-lb. farm tractor now being shown meets these conditions by letting the engine perform the steering operation through gearing from the motor cam shaft. Connection is made through two clutches actuated by a shaft with a crossbar, which is turned by pulling one rein or the other. The lower end of the same shaft, when both reins are pulled together, turns a ratcheted cam, throwing the main clutch alternately out and in. A third rein shifts the gears into first, second, neutral, and reverse, through a pair of cams, an indicator showing their position.

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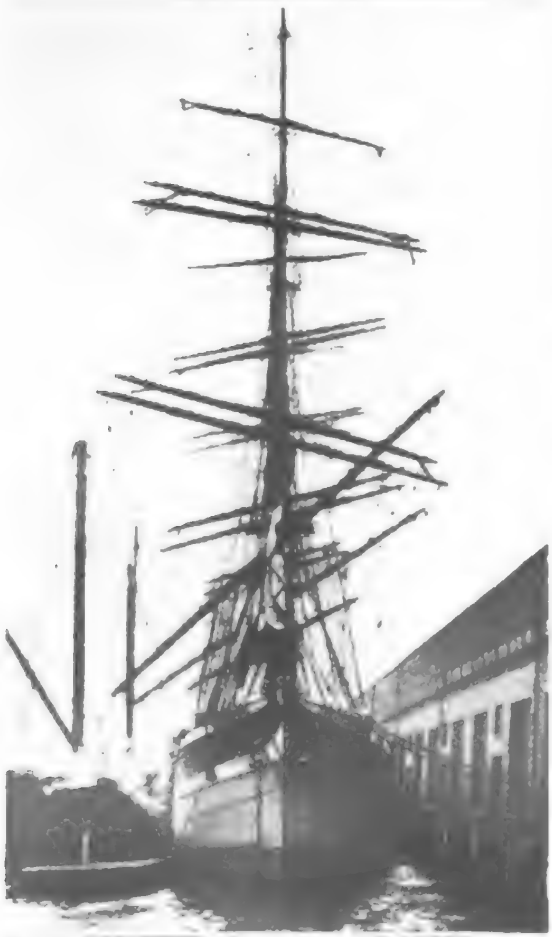
## SAILING SHIP OF OLD BRINGS DYEWOOD FROM ARGENTINA

Reminiscent of the days when our grandfathers adventured in strange seas, the two-masted sailing ship "Valiere" was



Two-Masted Sailing Ship of the Old Style, the "Valiere," Recently Docked at New York with a Cargo of Dyewood from the Argentine

recently warped to its dock at Pier A, New York City. It brought from Buenos Aires a cargo of 3,035 pieces of wood of the red quebracho, Argentina's natural dye product, whose value, since 1914, has risen enormously. The journey took 57 days.

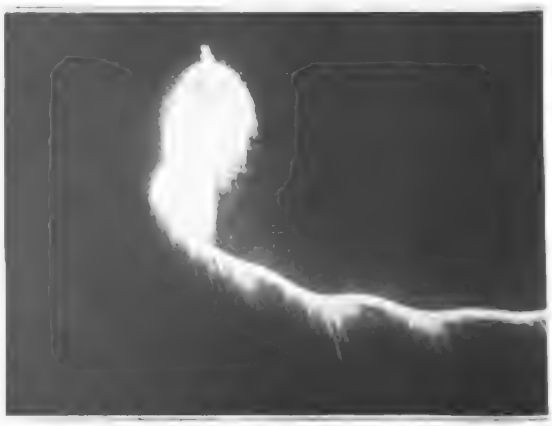
## ELECTROMAGNETIC LAW SOLVES RIDDLE OF SOLAR TORNADOES

Cyclonic or whirling storms in the earth's atmosphere are governed by a well-known law of rotation, turning clockwise in the southern, and counterclockwise in the northern, hemisphere. Familiarity with this phenomenon has induced astronomers to study the rotational direction of the tornadolike gaseous disturbances on the surface of the sun, commonly known as sun spots, in order to discover possible similarities. Their method is interesting, as it is the result of a recent revelation that these sun spots are in reality gigantic rotating gaseous masses, in which electrically charged particles are whirled at high velocity. Hence the investigators study a vortex just like a simple electric coil, inspecting the end nearest the earth with the aid of a giant spectroscope to determine its polarity. Finding it a north or south pole, the scientists know at once, by rudimentary electromagnetic law, the direction of rotation of the electric particles, and consequently of the gaseous mass itself.

At this point the observers were puzzled. The solar tornadoes, unlike those of the earth, seemed to whirl in any direction they pleased, in both northern and southern hemispheres. The irregularity proved to be quite regular on further investigation, however, as the electric tornadoes, or spots, were found to travel almost invariably in pairs, of opposite polarity, and therefore of opposite rotational direction. But here the story stops abruptly, as no adequate explanation of this queer pairing has yet been offered.

## FLARES ON NIGHT-STUNTING PLANE MAKE VIVID PICTURE

A queer record is left on an exposed photographic plate by an illuminated airplane performing evolutions in an inky sky. In the illustration, the flares carried by the plane have traced for the photographer a path like that of a drunken comet. The pilot has evidently done a number of stunts in dizzying succession.



This Looks Like the Trail of a Comet Gone Wrong. It Is Really the Path of an Airplane, Equipped with Flares and Flying in a Dark Sky

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## LANDSLIDES ON TWIN PEAKS KEEP ROAD WORKERS BUSY

Twin Peaks, San Francisco's matched pair of mountains, seem to be conspiring to make life miserable for the guardians of the beautiful concrete-asphalt highway to their summit. On one recent occasion 40 ft. of earth, 6 ft. deep, slipped out from under the road, leaving it to display surprising ability to maintain itself in mid-air. Again, a heavy concrete wall toppled over, carrying away 50 ft. of walk and roadway. Another slide wrecked 200 ft. of fence and piled itself a third of the way across the 25-ft. highway. This emulation of the Panama Canal's early depravity is assumed to result from seepage of water in the city's reservoir at the mountain's summit.

This Is the Spot Where the Earth Slid Out from Under the Road, Leaving a Bridge

One of the Twin Peaks Responsible for the Earth Slides is Seen Beyond the Highway

At This Point 200 Feet of Fence Went Down, and the Mountain Spilled Its Soil Out onto the Highway

## FROZEN BLOCKS OF FISH FIND FAVOR IN NORWAY

Large factories have been erected in Norway for freezing fish without the use of ice. As the industry is practiced there, the catch of the fishing fleet is cleaned in the home harbor, thence shipped to the factory, where the fish are pressed into blocks and frozen by artificially produced low temperatures. It is stated that the first shipment of the blocks to Christiania was sold with such ease that the manufacturers are now eager to place their commodity on the export market.

## MOTORCYCLIST CLAIMS RECORD LOAD FOR HIS MACHINE

An ardent motorcyclist recently decided that he would lay in next winter's firewood on a certain day, or know the reason why. The day came, and the mules who were to have done the heavy work ran away, smashed the wagon, and ruined the harness. However, the motorcyclist was resourceful. He borrowed a neighbor's smooth-running auto trailer, hitched it to his motorcycle, and brought home more than a ton of wood in one trip. Although an additional 250 lb. in the sidecar burdened the little motor with a total load of 4,275 lb., no appreciable difficulty was encountered in making the four-mile haul.

The Motorcycle Again Proved Itself the Emergency Machine When It Hauled This Man's Firewood

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## ARMY STUDIES AIR CURRENTS WITH SMALL BALLOONS

In modern warfare knowledge of the upper-air currents is vital to the success of either aerial or chemical operations. For sounding these atmospheric heights the army uses small spherical balloons of thin rubber. These are inflated with hydrogen gas to a diameter of 30 in., and their movements as they ascend are studied with a theodolite. The meteorological section of the Signal Corps made observations every four hours by this method.

PHOTO BY SIGNAL CORPS, U. S. A.

**Rubber Sounding Balloon, Used for Exploring Upper-Air Currents, in Process of Inflation with Hydrogen: The Pivoted Arm, with Its Weight, Tells When It Is Time to Shut Off the Gas**

## ROUMANIA COUNTS THE COST OF WAR WITH GERMANY

Roumania suffered at the very beginning of the war by the closing of the Dardanelles and the consequent stopping of all essential imports. And in their administration of the Treaty of Bukharest the Germans did more to increase the ruin. Requisitions are said to have exceeded all stipulations; peace became more dreadful than war. Released now from German bondage, Roumania has been taking stock. As a typical item in her inventory it is reported that out of 2,000 locomotives before the war, Germany has robbed her of all but 15. She looks to American manufacturers for part of the 600 which she needs.

## SIDE-DUMPING TRUCK BODIES FOR ROAD-BUILDING WORK

A builder of good roads in the vicinity of Windsor, Vt., is using a pair of two-ton motor trucks equipped with wide, low bodies, readily loaded by shovel labor. The sides, hinged at the top, open with a lever to allow any desired quantity of sand or gravel to escape. The body is partitioned into four compartments.

**The Side Gates of This Truck, and Its Hopper-Shaped Compartments, Enable Road Builders to Dump Its Contents in Small or Large Quantities. The Low Body Makes Shovel Loading Easy**

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Here, at the Left, is Depicted the Type of Motor Scow Used by the Fish Commissioners for Dragging Seines in Inland Lakes, While at the Right, in the Folds of the Seine Itself, the Water is Boiling with the Struggles of Hundreds of Captured Fish

## THREE TONS OF HARMFUL FISH REMOVED FROM RESORT LAKE

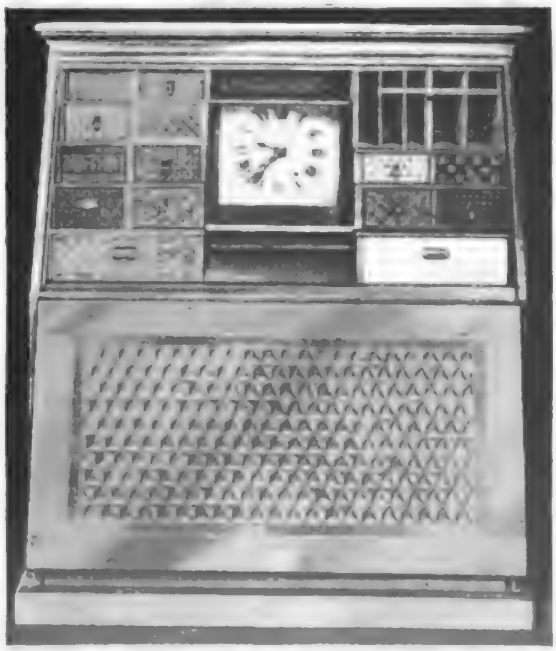
To preserve the game fish, menaced by the encroachments of coarser species, the waters of one of Illinois' famous resort lakes were netted this spring by members of the state fish commission. The long seines, operated from motor scows, brought in three tons of German carp, which were removed from the scene. Specimens weighing 55 lb. were included in the catch. In the process, however, some four tons of bass, northern pike, wall-eyes, and channel catfish were brought to light, a number of them very large. These were returned unharmed to the water, except for a few retained for the state hatcheries.

## TEXAS OIL BORINGS EXAMINED FOR VALUABLE DEPOSITS

A geologist of the University of Texas is making one stone kill two birds by examining and recording the cores from oil borings throughout the state. He is doing this in the hope of eventually charting with reasonable accuracy the beds of potash and other minerals and salts which are believed to underlie many parts of Texas.

## FIFTY-FIVE THOUSAND PIECES IN HISTORIC CABINET

It is with a wholly justified pride that a veteran of the Civil War, Thaddeus Coffin, of Newcastle, Ind., who saw service in Capt. William McKinley's Ohio company, exhibits to his intimates a cabinet, made with his own hands, containing no less than 55,000 pieces of wood. Of these, more than 100 have historical value of their own, having been taken from



Cabinet Containing 55,000 Pieces of Wood, Put Together by a Veteran of the Civil War: It Has Specimens from the Charter Oak, the Battleship "Maine," the Keel of the "Constitution," and Many Other Famous Sources

famous American trees, as well as from ships and structures of celebrated memory. The inlays, ⅛ in. thick, are nearly all in their natural colors, the foliage of the "Charter Oak" in one panel being, however, tinted green. A tablet on the front of one of the drawers is done in the dots and dashes of the telegrapher's code, and, translated, tells something of the work of building the cabinet, which is 4 ft. 6 in. high and 3 ft. 4 in. wide.

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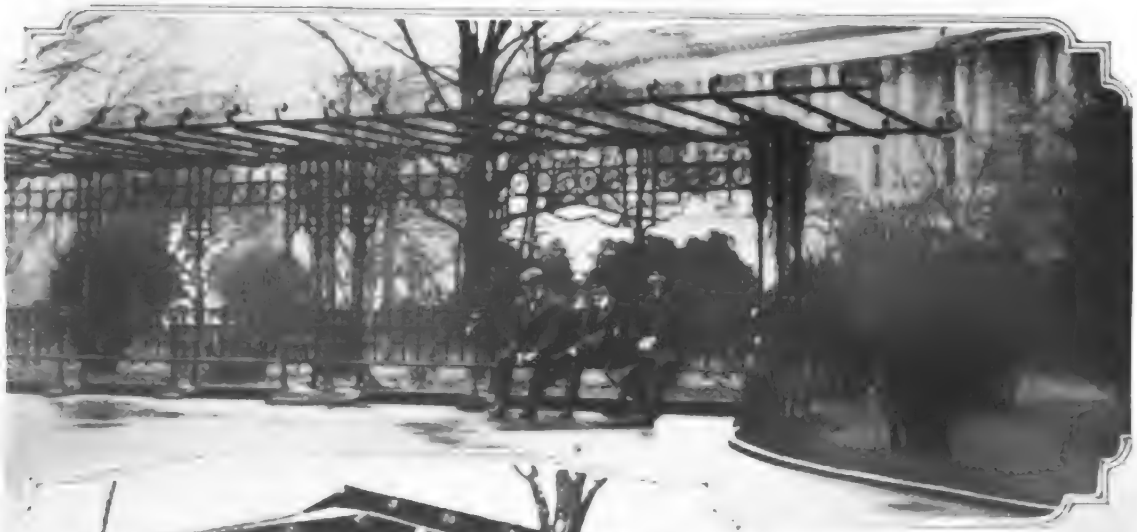
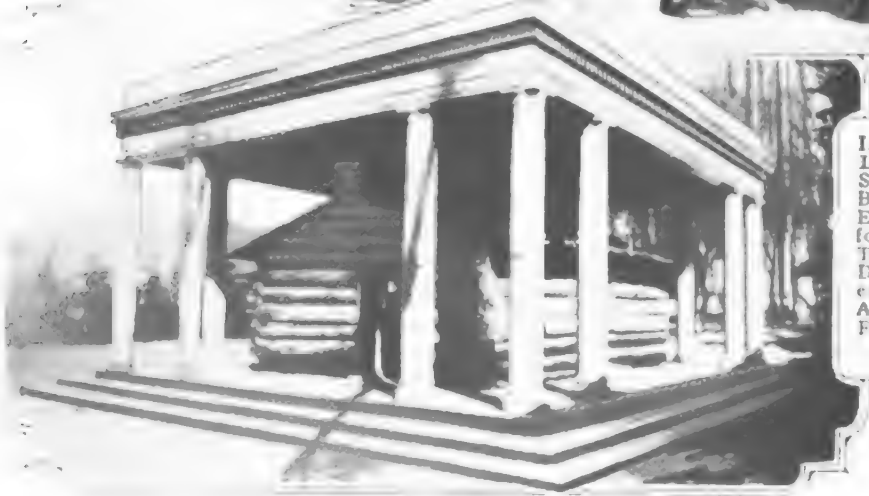
# CIVIC FEATURES THAT PROMOTE THE COMFORT



Two of These Wrought-Iron Pergolas Grace the Grounds of the Capitol Building at Washington, One at the North and One at the South. Vines in Summer Shade the Ornamental Seats Beneath

The Red Cross Chapter at El Paso, Texas, Occupies Its Own Log Cabin in the Central Plaza. Inside Are a Shop, a Tea Room, and a Large Fireplace. Decorations Are in Canary and Light Blue

South Pasadena, California, Finds That a Seven-Foot Strip of Concrete at Each Side of an Asphalt Pavement Prevents the Skidding of Motor Vehicles in Wet Weather. This Trial Strip on Fair Oaks Avenue Proved So Successful That All Future Paving will Use the Plan



In Temple Square, Salt Lake City, an Artistic Shelter in the Greek Style, Built of Wood, has been Erected as a Protection for an Old Log Cabin. This Humble but Historic Dwelling was Constructed by Brigham Young About 1847, and Was the First House Built in Utah by Mormon Pioneers



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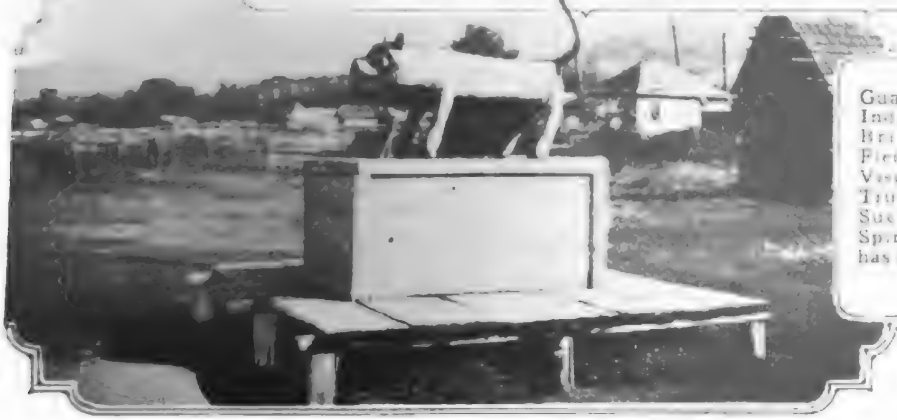
On the Theory That Nothing Artistic can be Objectionable, the Signboard Builders of the National Capital Proceed to Disarm Possible Criticism by Embellishing the Great Boards with Sculpture, Ornamental Moldings, and Lattices. This One is Opposite the Union Station

This Memorial to the Man Who First Raised the United States Flag in Southern California is Protected by Surrounding It with a Pool of Water in a Ten-Foot Concrete Basin, with an Outer Wall Two and One-Half Feet High

Some of Cincinnati's Fire Hydrants are Fitted with a Small Faucet and an Iron Bucket on a Long Chain, Whose Purpose is Indicated by the Sign

This Ancient Indian Shell Mound on the Shores of Tampa Bay has been Equipped by the City of St. Petersburg, Florida, as an Observation Tower, with a Flight of Stairs Up to the Platform



Guarding the Grave of an Indian Chief at Kitwanga, British Columbia, This Fierce-Looking Totem Is Visible from the Grand Trunk Pacific Railway. Its Success in Repelling Evil Spirits Is Apparent, for It has Stood Just So for Many Years

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The Close-Up View of the Little $400 Biplane Shows the Motorcycle-Engine Power Plant, and the Simple Details of Construction Which Bring the Price within Everybody's Reach. The Other Picture Is of the Designer's First Flight in His Creation, Made along the Beach in the Face of a Stiff Sea Breeze

## USE NATURE'S BARBED WIRE FOR SOUTHWEST FENCES

Ocotillo, a species of candlewood growing in profusion in the cactus country, has stems an inch in diameter, from 8 to 20 ft. long, and thickly studded with long, sharp thorns. By the simple expedient of placing the fence posts at closer intervals, Arizona ranchers are able to use these tough branches in lieu of barbed wire. It has proved so satisfactory that its use will be continued until wire prices go down.

Specimen of Ocotillo Plant, Whose Long, Thorny Branches Enable Arizona Cattle Men to Use Them as a Substitute for Barbed Wire

## SMALL PLANE BUILT AT COST OF MOTORCYCLE

A cast-off motorcycle engine forms the nucleus of a surprisingly efficient little biplane that is said to weigh only 250 lb. During the war the designer has worked on aviation contracts, but for the last few months has devoted his talents to the construction of a small, low-priced plane intended to come well within the purchasing power of the average man. He seems to have succeeded, too, as his little ship, he says, can be duplicated for $350 or $400. His two-cylinder, 9 to 18-hp. engine pulls him over the tree tops at 35 to 40 miles an hour.

## WELL-STOCKED FLOATING SHOP POPULAR WITH BRITISH NAVY

Men of the British navy who stood the monotonous four-year vigil at Scapa Flow, just north of Scotland, recall with gratitude the good ship "Borodino" which made life endurable during the long, tedious months. Formerly an ocean liner, the "Borodino" was taken over in the first months of the war and converted into a complete marine department store and recreation center. Here Jack Tar could buy all the little luxuries he values so much: fancy groceries, fresh meat and fish, wine, tobacco, new clothes, and sporting goods. In addition he enjoyed the use of an efficient laundry, a barber shop, a smoking room, and a billiard parlor. Every feature of the enterprise was enthusiastically supported by the sailors, and particularly by the Americans, who soon enjoyed a reputation as liberal spenders, and as sufferers from the worst cases of "sweet tooth" on record.

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## ARMY FOOTBRIDGE RESTS ON CANVAS FLOATS

The innumerable canals and streams that cut certain sections of the western front made the construction of footbridges part of every battle order. Realizing the cost in lives of these crude little structures an American engineer devised a collapsible pontoon footbridge which, reports say, could be carried, 285 ft. to the truck load, and erected in short time. Erection is simple. Across the stream is stretched a heavy rope to which canvas floats, or boats, are attached at regular intervals of about 3 yd. From boat to boat are laid lengths of the "duckboard" so much used in trench warfare. A handrail is added and the bridge is complete. These little structures were always built under the most trying circumstances; thus, it is stated that the bridge in the illustration was finished under such heavy fire that the doughboys had to wait 26 hours before they were able to cross.

**This Footbridge, across a Canal a Few Miles North of Verdun, is Built of Duckboards Resting on Canvas Floats, Adapting It to Construction under Fire**

## BALLOONS NEST IN RUINS OF OLD BUILDINGS

When fire destroyed several large buildings near an army balloon school, it was found that just enough of the foundations and basement remained to make the ruins useful. The first thing required of a nesting place for the big balloons is protection from the wind, which gets under them so easily and tears them from their moorings. The old foundations did this excellently; and with the removal of the débris and the erection of a few windbreaks they seem to be even more satisfactory than the usual excavations made at a considerable outlay of both money and time.

**These Old Foundations are Now Supplemented by a Few Wooden Windbreaks, to Protect Army Balloons from the Sweep of the Wind**

Citizens of Strassburg, Alsace, are cheered by the return to their old nests of the famous storks which have avoided the city for the last five years.

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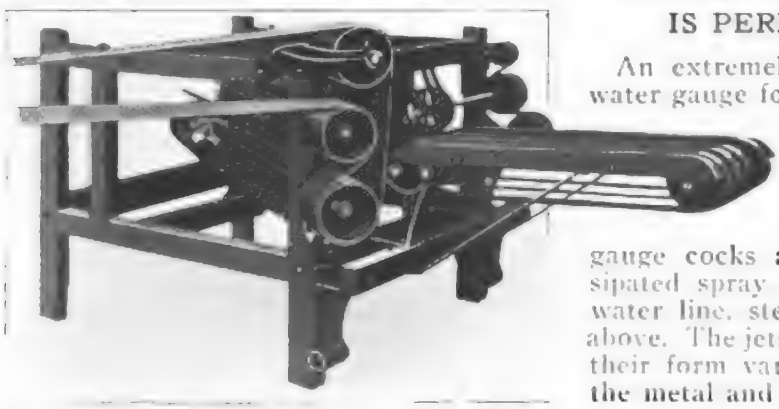
This Shipyard Traction Engine Weighed 28,000 Pounds, and a Special Trailer was Made to Fit It, but an Ordinary Motor Truck Found No Trouble in Moving It in This Manner

## THRESHER FOR BROOM CORN UNLIKE OTHER KINDS

In threshing broom corn it is the straw that is most important, instead of the grain. A threshing machine designed for handling this crop, therefore, has a feeding belt arranged to keep a tight hold on the stalks while it inserts the heads between spiked rollers. These, revolving in opposite directions, quickly strip the seeds off. The feed belt then deposits the straws on a table beyond the rollers. A hand-feed model has the rollers alone, the operator holding the stems.



Inside the Frame of the Machine may be Seen the Spiked Rollers for Threshing Broom Corn, Which are Driven in Opposite Directions by the Arrangement of the Belt on the Pulleys. Part of the Feeding Device is Seen at the Right

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The tail spin and the nose dive are said to have been responsible for the majority of the 106 fatalities at the three Texas training fields for airmen

## FOURTEEN-TON ENGINE HAULED ON SPECIAL TRAILER

The modern maxim, that a motor truck can haul much more behind it than it can carry upon it, was well illustrated in the recent moving of a 28,000-lb. traction engine at Oakland, Calif. A special trailer was provided to accommodate the engine, and though several grades were encountered, no difficulty was experienced.

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## WATER GAUGE FOR BOILERS IS PERFORATED METAL

An extremely simple and unbreakable water gauge for boilers is described by an English engineer. A metal tube, replacing the usual glass in its mountings, has perforations $\frac{1}{32}$ in., or less, in diameter. When the gauge cocks are opened, a rapidly dissipated spray of water issues below the water line, steam of course, coming out above. The jets are instantly distinguished, their form varying with the thickness of the metal and the size of the holes.

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## EXPERTS WRITE BIOGRAPHIES OF 150 VARIETIES OF WHEAT

The wheat-growing world should find much of interest in the census, now being compiled by the Department of Agriculture, of each variety of wheat grown in the United States. It is a bigger problem than it seems, too, as 150 varieties, known by 500 names, must be investigated and a complete history written of each.

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## MATERIAL SOLD AT DISCOUNT TO FOSTER HOME BUILDING

It is doubtful whether any slogan aims closer to the heart of American maladjustment than the familiar "Own Your Own Home." The movement is finding whole-hearted supporters everywhere; but in one city enthusiasm has crystallized into an organized campaign with this noteworthy feature—a discount card is granted by the local committee to every prospective builder who has broken ground and can prove his intention to begin construction immediately. These discount cards enable him to get reductions of 5 to 10 per cent on purchases of many sorts of material, a small saving perhaps, but often just enough to swing the balance from "building next year" to "building now."

## EXHIBITS SHOW PUBLIC HOW GOVERNMENT SPENT MONEY

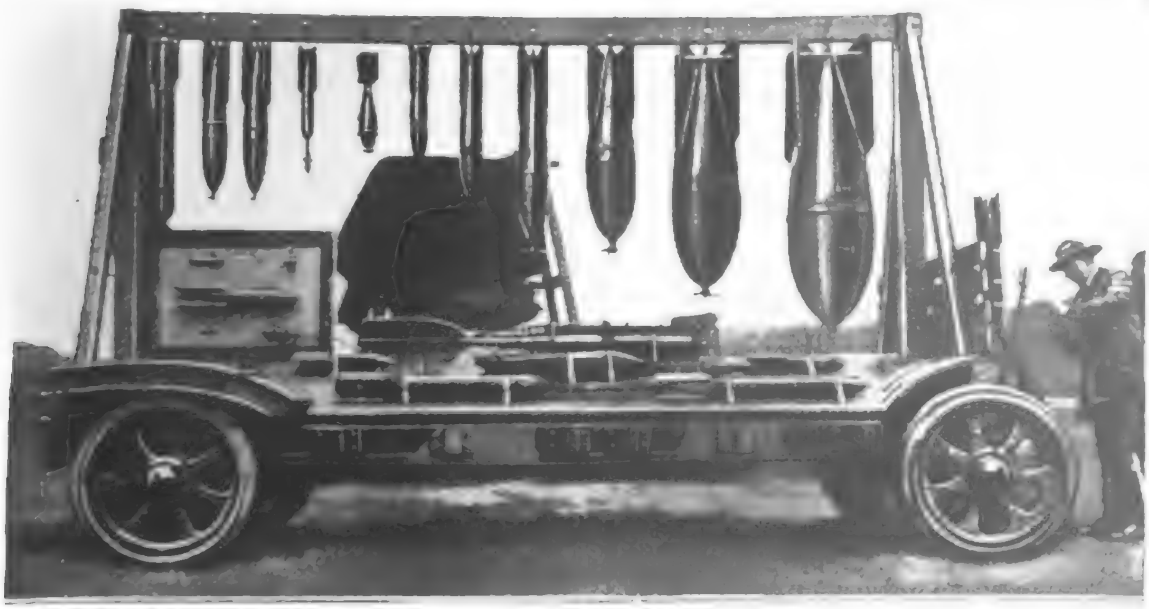
In gratitude to the loyal citizens who sacrificed and saved to buy Liberty bonds, the government is now exhibiting, in so far as possible, the engines of war that were bought with the money. Many of the exhibits proved the efficiency of the war-time censorship, by displaying ingenious Hun-destroying guns, projectors, and other contrivances that the public never dreamed of.

## GROWING POPULATION TAXES CAPACITY OF SCHOOLS

Growing pains are to be expected in a healthy young nation like the United States. This discomfort is nowhere more

**This Ill-Lighted Corridor Makes an Unsatisfactory Schoolroom, but It Is the Last Resort of the Authorities in a Typically Overcrowded American City**

acute than in the public schools of our large cities, where there are often two youngsters for every desk. Temporary relief has been obtained in San Francisco, however, by holding classes in the corridors.



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**Little Packages Like These Made the Cities along the Rhine Very Unpopular during the Last Months of the War. This Collection of Aerial Bombs Used by the Various Allied Nations is Displayed by the Government in an Effort to Show the People Where All the Money Went. The Smallest Missile Weighs 27 Pounds; the Largest, on the Right, Weighs 1,100 Pounds**

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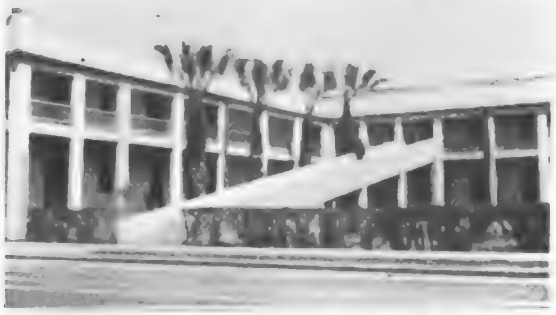
## STRETCHER CASES CARRIED UP INCLINE IN COMFORT

When the ambulance draws up before a certain midwestern hospital to discharge



Stretcher Cases are Carried up This Incline, without Jolting or Other Discomfort, to the Receiving Room on the Second Floor

its sufferers, the stretcher bearers are faced by a gently sloping runway, 150 ft. long, and built of reinforced concrete. Up this easy incline they carry the patient, without the usual jolting and tipping, to the receiving room on the second floor. In addition to this constant prevention of pain and discomfort, the runway has also proved a blessing to convalescents, who are easily rolled up and down on their wheel chairs.

## AUTOMOBILE KILLS LIONESS ON ROAD IN AFRICA

Out of Africa comes a thrilling story of a lioness who engaged a six-cylinder car in combat, on a lonely brush road at night, and was worsted. The car was proceeding peaceably toward Nairobi when its lights suddenly caught the glare of a pair of eyes. The startled driver opened the throttle. As the car jumped to a 40-mile gait the animal leaped in front of it. When the driver looked back, after the shock, and saw the huge beast lying growling in the road, he reversed, and the wheels finished the unpremeditated task they had started. The lioness lay still. In the car's radiator was a slight dent—its only injury.

BY COURTESY OF THE SKETCH, LONDON

The Lioness was Killed When a Six-Cylinder Car Ran Her Down on an East African Road at Night. The Driver Finished the Job by Backing over Her

## ROOF OF TAXIDERMIST'S SHOP PILED HIGH WITH ANTLERS

A Wyoming taxidermist, who conducts his business in a quaint old log cabin on a hillside overlooking the town, manages to attract a good deal of interest, and probably considerable trade, by means of his unusual advertising display. He has piled on the roof of his cabin a collection

Approximately 200 Antlers Make Up This Unusual Advertising Display on the Roof of a Taxidermist's Workshop. As the Cabin Is on a Hillside above the Town, the Collection Draws Much Attention

of nearly 200 antlers, large and small, which he has accumulated in building up a reputation as an expert mounter of heads.

## DENDROGRAPH RECORDS CHANGE IN SIZE OF TREE TRUNKS

To record the daily and seasonal changes in size of tree trunks a group of botanists have fashioned an instrument called the dendrograph. In principle, changes in circumference are transmitted through a belt of hinged wooden blocks to a recording pen point on a revolving drum. In application, however, the apparatus is made in two forms. In the first, a number of plungers in radial contact with the belt carry on their outer ends an encircling wire. As the tree varies in girth the wire actuates the pen point. In the other type, a yoke with four points of contact embraces the belt, taking the place of the rods and wire.

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**The German Prisoners along the Top of the Dam are Assisting in the Construction of One Unit of the American Water-Supply System at Brest, France. The Completed Plant Stores 16,000,000 Gallons and Has a Capacity of 4,000,000 Gallons a Day**

## BREST WATER SYSTEM FORMS MONUMENT TO YANK ENERGY

American resourcefulness was nowhere more heavily taxed during the war than in the construction of the great military camp at Brest, France. Water supply was a typical problem met, in a typical American way, by the construction of a complete modern supply system. Reservoirs in the hills, pumping stations, and pipe lines were designed and erected in the face of discouraging difficulties. Labor was cheap, however, as German prisoners were often a drug on the market.

## RUSSIAN CHILDREN DO BETTER WITH AMERICAN FOOD

As a result of the food distributed by the American Red Cross among the children of 122 schools in Archangel and outlying districts of Russia, great improvement is reported in both attendance and work. In a little more than six weeks, 8,161 cans of milk, 7,341 lb. of crackers, 4,224 lb. of sugar, and 2,049 lb. of cocoa were consumed. The grateful children have sent toys and letters for their American cousins to Red Cross headquarters.

## IOWA VICTORY-LOAN SIGN OF UNUSUAL BEAUTY

Designed by the local committee, a Victory-loan bulletin board of more than ordinary beauty was displayed at Charles City, Ia., during the late campaign. Its 26 by 21-ft. surface, flood-lighted at night, bore a huge "V," and in the center, the

**Victory-Loan Bulletin Board, 26 by 21 Feet, Displayed at Charles City, Iowa, and Flood-Lighted at Night: The "V" Is Light Blue, the Lettering Black, on a White Ground**

lines "If ye break faith . . ." from Lieutenant McCrae's famous war poem.

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## DETECTIVES NOW WEAR MASKS WHILE VIEWING CRIMINALS

Criminals of the more astute, and therefore more dangerous class, soon become familiar with the features of police-force members, greatly increasing the difficulties of crime abatement. A number of large cities have adopted the system of requiring plain-clothes policemen to wear face masks during the inspection of criminals or suspects. The detectives are thus safe from subsequent identification.

Detectives of St. Louis, Missouri, Now Wear Masks When They Examine Captured Criminals or Suspects, So the Underworld Denizens will Not Know Them the Next Time They See Them. Other Cities have Also Adopted the System

## ADDRESSES INSIDE PACKAGES ADVISED FOR PARCEL POST

Users of the parcel post are now advised by government authorities to include in their packages a card bearing the name and address of both sender and addressee. In this way post-office officials will be able to forward an article even when the outside address is obliterated, or the wrapper entirely removed. The public is further reminded that the return to pre-war postal rates on first-class mail, effective July 1, 1919, will also apply to Canada, England, Scotland, Ireland, Wales, and the other countries to which domestic rates now apply.

## HYPNOTIZED BY COMING SMASH, AIRMEN LOSE SENSE OF FEAR

Friends of those who have lost their lives in airplane accidents should find consolation in the stories of many who have had lucky "squeaks," in which they have resigned themselves to seemingly inevitable death, yet escaped to tell the tale. They often declare that their minds seemed hypnotized, even "frozen," by the impending disaster, and that the few seconds before the crash were filled, not with dismay, horror, or fear, but with a keen absorption in some trivial detail. Thus, one airman falls vertically to earth with his eyes riveted on a green patch of grass which he is very sorry to spoil; while another speculates on the probable duration and character of the noise caused by the coming smash-up.

## GRADES HIS LAWN WITH DRAG PULLED BY SMALL AUTO

An ingenious house owner in Alhambra, Calif., wishing to prepare his large lawn at the least possible expense, made a drag by nailing two planks together and wrapping chain around them. This implement he hitched to his small touring car and hauled about the grounds, until all clods of earth were broken up and the ground thoroughly pulverized and leveled. This was accomplished with a total expenditure of five gallons of gasoline.

A Pair of Planks, Wrapped with Chain and Hitched to the Rear of a Small Touring Car, Made a Highly Efficient Lawn Drag, Leveling the Ground and Breaking Up the Clods as Well as Any More Pretentious Device, and Quite Economically

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Innocent-Looking Packing Boxes Arranged to Conceal Fire Hydrants Just inside the Gates of a Strike-Bound Mill: A Length of Hose Attached to Each Hydrant Served as a Ready Repeller of Rioting Strikers

## CONCEALED HYDRANTS USED TO QUELL RIOTING MOBS

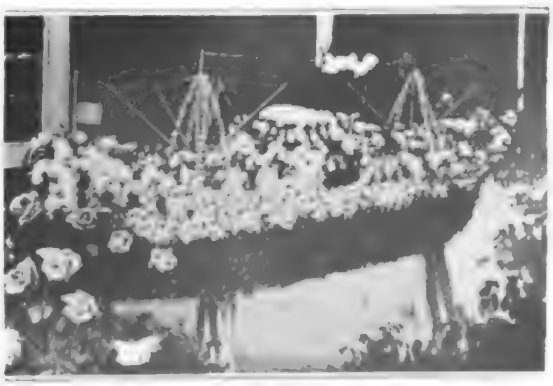
A solid stream of water, fire-hose size, has proven effective on more than one occasion for cooling the ardor of a rioting mob. In an eastern city, where a rather demonstrative strike was in progress, the guardians of the strike-bound mill kept a length of hose connected to each of three hydrants conveniently located inside the gates. Semicylindrical sections cut from old steel drums covered the hydrants, being easily tipped over when trouble arose. Later these were replaced at two hydrants by packing boxes open at back and bottom. The innocent appearance of the old boxes added greatly to their opportunity for service. In emergency a few moments sufficed to turn the key and start the flow of water, which is more potent for its purpose than a machine gun.

## VISCOSITY SAID TO INDICATE STRENGTH OF GLUE

A series of experiments in the testing of glue have been taken to prove that, after all, the simplest test is the most reliable. The old idea that the strength of the substance could only be known through a chemical determination of the various ingredients is declared liable to error. The experimenter maintains that the binding strength may simply be expressed in terms of the viscosity, or in a general sense, that the slower it runs from the bottle the better the glue. In a scientific way, he measures this strength in terms of the ratio between the time required by a volume of glue dissolved in water to flow through a narrow tube, and the time required by a similar volume of pure water.

## FLORAL SHIP IN FULL DETAIL HONORS DEPARTED WORKER

Floral anchors we have had since horticulture began, but a whole ship done in flowers is an unusually ambitious undertaking. Shipbuilders of a western yard not only assembled such an offering in tribute to a departed fellow worker, but reproduced in technical detail the type of



Floral Ship, Remarkably Correct in Technical Detail, Constructed by Shipbuilders of a Western Yard in Tribute to a Deceased Fellow Worker

ship upon which he had worked. Even the rigging occupied its correct position on the fragile structure.

¶ Holland's railroad interests are actively engaging in the construction of the new-style concrete rolling stock, in which only the wheels, axles, buffers, and couplings are made of steel.

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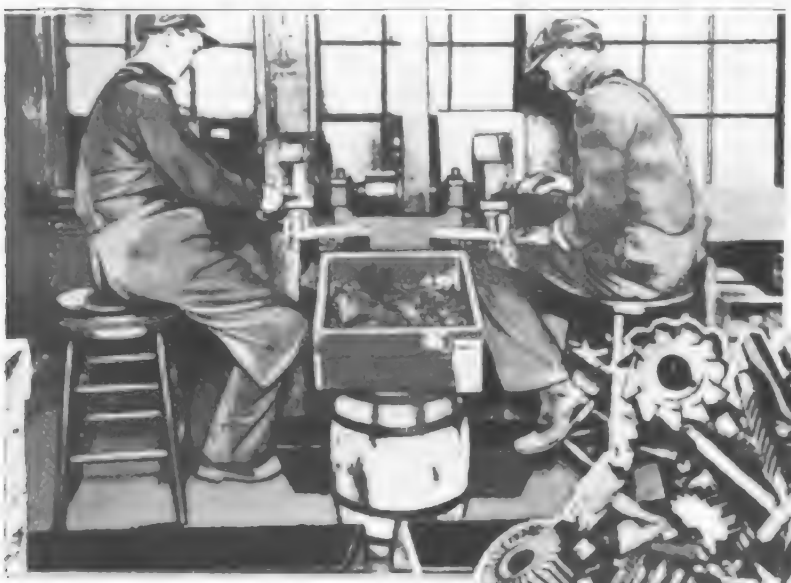
# RECLAIMING HIGH-SPEED STEEL SCRAP

Scrap high-speed steel has been given a definite value. New stock, in every way as good as the original, is being wrought by a new process from the waste left from tool making and the stub ends and broken parts of tools. Until recently this material was practically useless, and about 40 per cent of all the high-speed steel sold was ultimately thrown away. Many attempts made to weld the pieces together were without commercial success. The reclamation process, originated by a man possessed of much experience with the high-speed grades, faced the usual difficulties that hamper the commercial establishment of innovations. Since its demonstration of practicability, however, nearly a million pounds of scrap has been returned in the form of new high-speed steel. Its patrons, numbering more than '800, include two large railroads and many automobile manufacturers.



These Experts in High-Speed Steel Composition are Testing the Scrap and Identifying Its Brand by the Character of the Sparks It Emits When Pressed Against a Grinding Wheel

The primary difficulty was the variation in quality of the scrap from different steels, and the customers' insistence on reclaimed grades identical with their particular scrap. The fragments are received in miscellaneous lots of 25 to 100 lb. or more, a confused mass of all sorts and qualities. This seemingly perplexing problem proved really quite simple. The steels are identified by the character of the sparks they emit in contact with a grinding wheel, each brand giving forth its own colors, sizes, and shapes. The method is accurate, two or three experts coöperating in the determination.

When the new elements required for a specific result have been added, the steel is melted into ingots about 4 in. square and 2 ft. long. These are carefully annealed, reheated, and drawn and hammered into bars about 2 in. square and 6 ft. long. The last operation is rolling them into flats, rounds, and squares, the only specifications permitted the customers. The finished products are heat-treated in sealed tubes in special annealers, inspected, and shipped.

Even the rolling mills for these shapes, however, presented their peculiar problem. The comparatively limited tonnage, the variety of shapes, the necessary rigidity of the machines, all were objectionable points in the eyes of machinery men. This difficulty, too, the originators of the process themselves solved. In the mills they designed, each shape has its own machine unit, each set of rolls its own stand. The rolls are practically always in adjustment, so that high-speed steel can be used for the test bars, coming through practically to size, without the danger of mixing soft-steel specimens unwittingly with

This Is the Kind of Scrap That Comes to be Processed and Reclaimed—Broken Tools, Worn-Out Stubs, and Pieces of Waste

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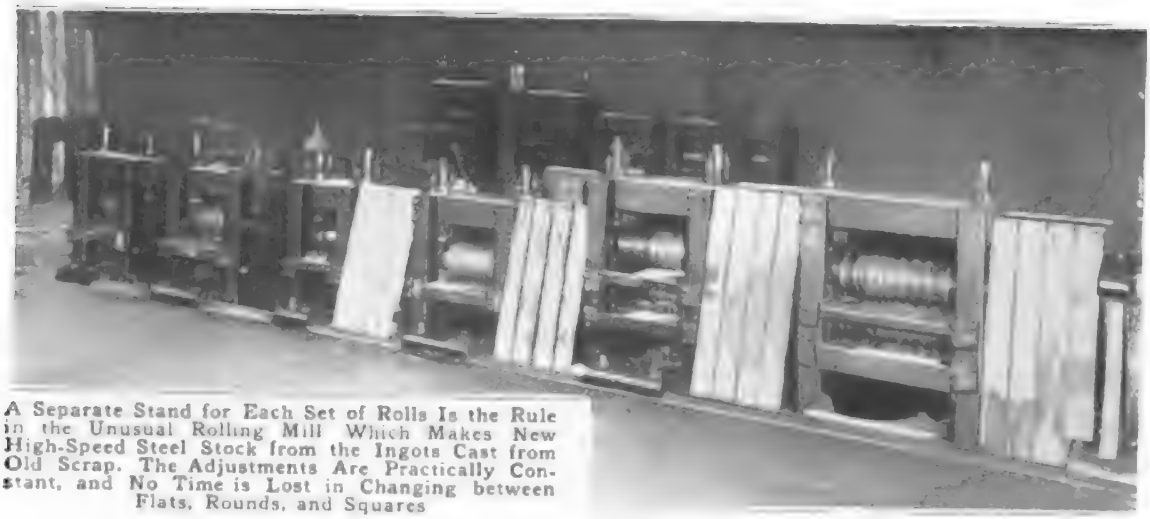
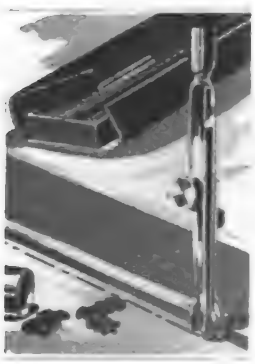


A Separate Stand for Each Set of Rolls Is the Rule in the Unusual Rolling Mill Which Makes New High-Speed Steel Stock from the Ingots Cast from Old Scrap. The Adjustments Are Practically Constant, and No Time is Lost in Changing between Flats, Rounds, and Squares

the product. The net result of all this care is a high-grade output of high-speed steel that gives no indication of its humble source in waste scrap.

## LINES FULL OR DOTTED MADE WITH NEW DRAFTING PEN

By placing a grooved wheel between the points of a drafting pen, a new instrument has been produced, capable of drawing dotted lines, dots, and dashes, or in fact any kind of ruled mark, continuous or otherwise. The ruling wheel, 3/16 in. in diameter, slips onto a tiny spindle on the inside of one point of the pen, which enters a hole in the other point when the pen is closed. Notches in the periphery of the wheel determine the character of the line, several varieties being furnished. An adjustable forked guard on one point, resting against the T-square, prevents blotting.



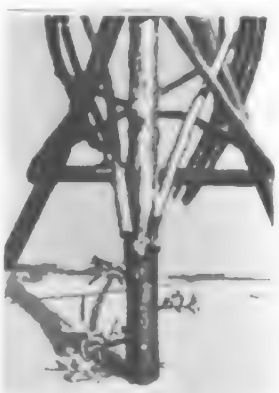
## NOZZLE ANCHOR DOES WORK OF FOUR FIREMEN

By using a "jack," or holder, four to six firemen can steady the nozzle of a powerful fire hose and deliver the stream at the desired spot. The continuous effort is fatiguing, however, and often keeps the men in dangerous positions for long periods. A simple 50-lb. anchor does the work just as well, besides releasing the firemen for duty elsewhere. The anchor is essentially a heavy three-point support for the nozzle.

The Stream from the Fire Hose is Held in Proper Direction by a Nozzle Anchor, Which Releases Half a Dozen Firemen for Duty Elsewhere

## ONE LEG OF RUSTIC TABLE BEARS HEALTHY SPROUTS

Among the furnishings of a South Carolina home is a small willow table that is the talk of the neighborhood. Although it has been kept indoors and far from any moisture ever since it was built and properly painted, several months ago, one leg is now the proud parent of four leafy sprouts, which thrive in their strange surroundings.



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## TURNSTILE ADVISES CAUTION AS WORKERS CHECK IN

Innumerable methods have been devised by employers in an effort to educate the workman to an intelligent concern for his own safety. A turnstile in a busy railroad yard is perhaps the latest. As the worker takes his time card from the rack in the morning, he is confronted by a sign which warns him, in three languages, to "Be Careful; Avoid Injury to Yourself and Fellow Workmen."

The Workers in One Railroad Yard are Greeted in Three Languages Each Morning by This Warning Turnstile Which Advises Carefulness throughout the Coming Day

## STANDARD "NO PARKING" SIGN ADOPTED BY OREGON CITY

To discourage the promiscuous parking of automobiles, the city of Portland, Ore., has adopted a standard form of official sign. A heavy metal base bears a disk with the words "No Parking," and designating the reason for reserving the space. In the center is the number of the city ordinance covering the situation.

Standard Form of "No Parking" Sign Used in Portland, Oregon: The Lettering Is Alike on All Except for the Designation of Reason for Reserving Space

## PASSENGERS MAY WALK DOWN FUSELAGE OF TRI-PLANE

The Tarrant super-triplane, being assembled in the government shops at Farnborough, England, has the unusual wing spread of 141 ft., but is featured by the cigar-shaped fuselage, which is built of wood and strengthened by a system of girders resembling the cage mast of an American battleship. This construction eliminates the usual inside wiring, and will enable passengers to walk down the inside of the 85-ft. fuselage, from the seats at the front to the tail at the rear. The plane should easily carry 100 passengers, as it was originally intended to carry an enormous load of high explosives to Berlin. Power is supplied by six engines which give a speed range of 80 to 100 miles an hour.

## SUN'S VARYING HEAT STUDIED FOR WEATHER FORECASTS

The little town of Calama, Chile, is located in one of the driest regions on the face of our globe. Day after day, almost without break throughout the year, the sun shines from a cloudless sky. Weather of this sort certainly has no appeal for the average man; yet two scientists from the Smithsonian Institution of Washington, D. C., find it ideal. As might be expected, their task is an unusual one, involving daily measurement of the heat reaching Calama from the sun, 93,000,000 miles away. Despite appearances, the work is thoroughly practical, as a striking correspondence has been discovered between the changing weather on our little planet and the fluctuating value of this solar radiation. In fact the two observers already telegraph their results each day to the government of Argentina, which makes them the basis of temperature forecasts for several days to come; and with such success that plans are now suggested for similar stations in other rainless portions of the earth, as in Australia, South Africa, Egypt, and India. By coördinating such widespread observations it is felt that remarkable results could be secured.

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**BALLOON PARADE IN ARMY AIR CIRCUS**

THE long-haired person who regularly assures us that there's nothing new under the sun is requested to find precedent for this balloon parade. Like the "Ponderous Pachyderms" of the old-fashioned street parade, the balloons passed in procession before the crowds at a great army air circus. Each of the big bags was kept in line by a motor truck and fifty soldiers.

## GERMAN PROPAGANDA AIMED AT ARMIES IN OCCUPIED AREAS

Investigation has revealed that the German propaganda system continues to be a virulent menace, particularly in the zones of allied occupation. The chiefs in Berlin seem tireless in hatching new schemes for fomenting distrust and mutiny among the allied troops. As an example, an American officer recently discovered that our men were being supplied with views of ruined villages which bore the misstatement that the destruction was caused by French and British artillery fire. The sale was stopped and thousands of cards confiscated. It has also come to light, again and again, that the retreating German army left behind it, in many localities, a population carefully coached in hypocrisy and deceit for future dealings with the advancing allied armies.

## RECREATION HUT IN HEART OF NEW YORK CITY

One K. of C. hut in New York City is located right in the heart of the Great White Way. Many returning Yanks are willing to declare it a great little location, too, after they've learned how very small their "thirty per" looks on Broadway.

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**This K. of C. Hut on New York's Great White Way Welcomes Hundreds of Returning Overseas Men Every Day. Some Sort of Entertainment is Always Provided for the Boys**

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**This Field is Covered with a First Year's Growth of Kudzu, the Forage Plant with Which a Florida Farmer has Achieved Such Remarkable Results. His Live Stock Seem to Prefer It to All Other Feeds, Even Browsing on Growth That has been Left on the Ground All Winter. In Addition, He Finds That It Enriches the Soil, and after the First Year Requires No Cultivation at All**

# KUDZU VALUABLE FORAGE PLANT

By ROBERT H. MOULTON

AMONG the many scientific discoveries brought about by the war is the fact that in kudzu, a leguminous plant, this country possesses one of the hardiest and most valuable forage plants known. Indeed, this remarkable vine seems destined to become one of the leading sources of wealth in certain sections of the United States in the future. Especially is this true of the southern states, where the slow development of agriculture has been due in large measure to the lack of good nutritious pastures and roughage that lasts throughout the entire year.

**It Was a Luxurious Growth of Kudzu Vine Like That Pictured Which First Drew the Attention of the Florida Farmer to the Plant, although He Considered It a Nuisance at the Time**

While kudzu is by no means a new plant, it was only a year or two ago that any extensive experiments were made with it, and the number of farms on which it was grown was insignificant. In fact, it appears not to have been studiously cultivated anywhere until a Florida man made the accidental discovery that his live stock seemed to prefer it to any other kind of forage plant, and that they waxed exceedingly fat upon it. As this was at a time when the high cost of feed forced many farmers to reduce the daily allowance of their animals, he hastened to plant a number of acres to kudzu, with the most satisfactory results.

It was not only as a feed for his farm animals that he discovered virtue in the plant, however. He found that, by reason of its power of extracting nitrogen from the air through the medium of the bacteria on its roots and adding this essential element to the soil, it quickly built up poor and worn-out land, making it fertile and productive. In this respect he believes it even superior to clover, alfalfa, and other leguminous plants. Last season he made the best corn ever grown in Florida, averaging 50 bushels to the acre, on land that the season before had been planted to kudzu, and this without any fertilizer whatever. What made the experiment more interesting was the fact that this land previously had never produced a good crop of any sort, being considered practically worthless.



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All this came about as the result of a few vines which had been planted on the lawn of his home for ornamental purposes. Kudzu makes a beautiful vine, and is one of the fastest growers known, producing a dense shade in a very short time. On the lawn of this Florida man it was grown to cover a summer house. So rapid was its growth, in fact, that after the second year he grubbed it out, because the vines trailed all over the lawn, making it impossible to keep the growth confined to the summer house. The three roots so dug up were thrown on a trash pile in one corner of the yard, with the idea that, since it wanted to run on the ground, it would grow and cover the trash pile.

During the First Year a Full Crop of Corn may be Grown on the Same Land, as in the Illustration. Neither Crop will Interfere with the Other, and Both Require About the Same Attention

It not only did this the first season, but continued to reach out until it covered all the adjoining fences, finally reaching the barn lot, where the family horse was kept. According to its owner, the horse literally wore his mane off reaching under the bars of the fence for the vine, while the neighbors' cattle and hogs continually broke through the fence to get to it.

Becoming alarmed, lest the plant might be poisonous, the owner of the horse sent some of it to the Department of Agriculture for an opinion. On learning from this source that kudzu had no known poisonous properties, he began investigating, with the result that it was found to contain an average of 17 per cent of protein, in one instance the percentage being 19.82. The average percentage of protein in alfalfa is 14.3 per cent. On a measured space 30 feet square he cut during one season at the rate of 44 tons of cured hay in four cuttings. This, however, was an exceptionally favorable season, there being no late frosts, and the first cutting was ready May 1. The second cutting was made June 11, the third the last of July, and the fourth early in September.

While it is not claimed that kudzu will make four cuttings every season, nor yield 11 tons per acre at a cutting, it is believed that a safe estimate is from two to three cuttings, with a yield of from four

This Is the Kudzu Field Shown on the Opposite Page, but in the Second Season of Growth. Although Kudzu Is a Vine, It Is Anchored to the Ground Every Few Inches, and Is Consequently Easy to Cut and Handle. The Vine does Not Drag Ahead of the Mower Blades as with Similar Growths. Neither Is It Harmed by a Heavy Rain during the Period of Curing

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to six tons per acre, anywhere that the plant may be grown under favorable circumstances; and experiments have proved that it is perfectly hardy all over the United States, enduring the winters as far north as Nova Scotia.

All the legumes, with the exception of kudzu, are more or less bad about dropping their leaves and shattering while curing and harvesting; and a heavy rain on them, or any of the grasses, hays, or fodders during the period of curing, means serious injury if not complete ruin. Kudzu, however, possesses none of these disadvantages. One planting lasts for many years and it may be cut or pastured at any time during the season, in north Florida, from about the middle of April until frost comes. And where there is a growth left on the ground, stock will feed on it all winter. Stock, in fact, have been known to eat the dead leaves and vines which have lain out and weathered until March, when it was hauled in for bedding, in preference to the best hay that could be bought. Its roots penetrate the soil deeply, for which reason they remain green and full of life during the entire growing season. Accordingly, the hay can be cut at any time when weather conditions are suitable for curing hay, as kudzu is not injured by waiting for good weather as other hay crops are. In fact, even if kudzu is thoroughly soaked during the curing period, it will afterward show little or no effect of the wetting.

Most people might think that, because kudzu is a vine, it must be very difficult to cut and handle it as a hay crop. On the contrary, experience has shown that it is no more trouble to cut or handle than a heavy crop of red clover, Mexican clover, crab grass, or any other hay that makes a matted growth, while it is much easier to handle than either cow-pea or velvet-bean hay. Unlike the cow pea and velvet bean, kudzu is anchored to the ground every few inches, and so the vines cannot drag ahead of the mower blade, as they do in the case of the peas and beans.

Kudzu should be propagated by means of the rooted plants, for when these plants are removed to new fields they carry with them the bacteria, on the tubercles of their roots, which are necessary to inoculate the new soil in order to secure the best results. These roots live for many years. When the plant becomes well established it needs no further cultivation, being able to control native weeds and grasses without assistance.

The proper time for planting kudzu is two or three weeks in advance of corn planting, or a little earlier if one can get the ground ready. A full crop of corn may be grown on the same land during the first year by simply dropping the grains between the plants. Neither crop will interfere with the other and both need about the same attention. The ground, however, should be left smooth and level at the last cultivation to permit easy rooting of the vines or runners and subsequent mowing for hay. After the first year the kudzu will not need any cultivation at all, as the vines will run all over the ground the second season and take root at the joints.

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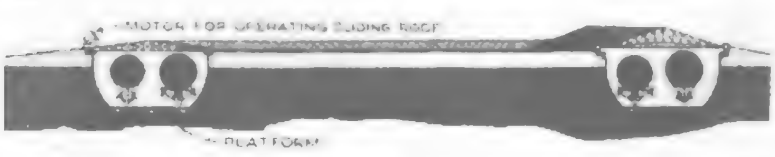
## PROPOSE RING-SHAPED SUBWAY AS HANGAR FOR AIRSHIPS

A subterranean airship hangar in the form of a huge ring was one of the German military plans which have been brought to light. The construction proposed took the form of an annular trench, with a light iron roof on rollers, pivoted at the center of the ring. The typical arrangement was a trench, 131 ft. wide at the top, tapering to a narrower bottom and lined with a thin coat of concrete. The depth depended on the type of airship to be housed. In a circle 607 ft. in diameter, such a trench would accommodate eight ships of average size. The rolling roof, as well as the sliding doors in it, were operated by an electric motor. An opening for launching could be made at any point in the circle, selection being influenced by the direction of the wind at the time. As a further refinement in this direction, a rotary movement for the bottom platform was also proposed, to bring any airship around to the desired point.




**Cross-Sectional View of Annular Trench, a German Proposal for Housing Airships; The Roof, Revolving on Rollers, is Operated by the Electric Motor Seen at the Ground Level at the Left**

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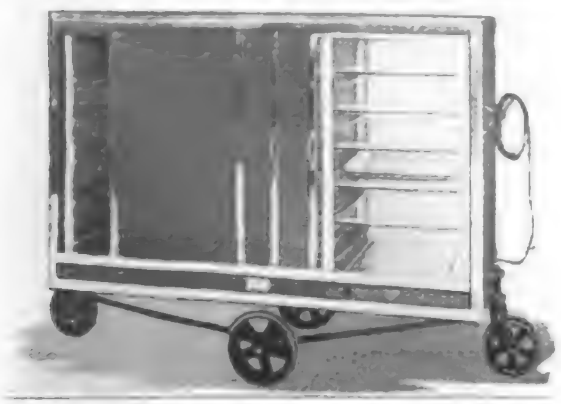
## AMERICAN LOOPS THE LOOP 300 CONSECUTIVE TIMES

The American lieutenant who looped the loop 300 consecutive times at Issoudun, France, stopped when he did only because his gasoline supply was exhausted. The record was made with a Morane monoplane at an average altitude of 2,000 ft., every loop being witnessed and recorded by watchers on the field. Their records show that the first hundred loops were made in 24½ minutes; the second hundred in 20½, and the third in exactly 20. After the 300th figure the plane glided smoothly to earth, not more than 100 ft. from the starting point. An examination was held and the plane found in perfect condition except for a loosening of the engine bolts.

## PORTABLE TRAY RACK WARMS FOOD FOR PATIENTS

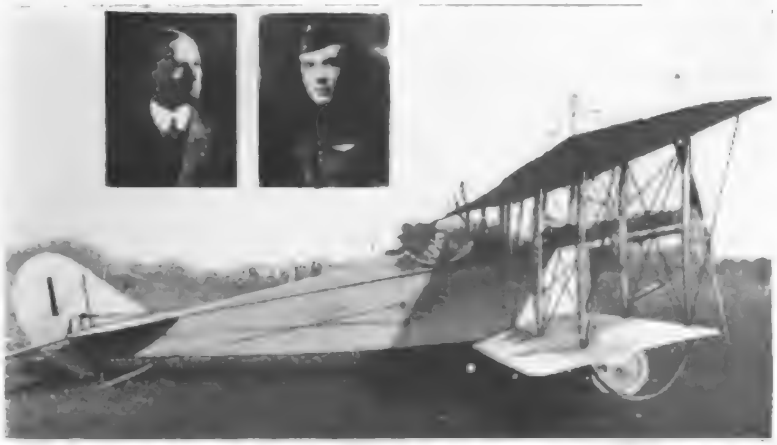
Food is served hot to patients in many hospitals by means of a tray rack that is heated by electric coils throughout its walls, and moved noiselessly through the wards on its rubber wheels. The rack, or truck, is about 5 ft. long and 4 ft. high, and holds 15 loaded trays. Close-fitting, sliding doors retain the heat in transit, while a plug and cord connection supplies current to the coils when a stop is made to distribute food. The top of the truck does duty, too, as a carrier for dirty dishes.



This Tray Rack is Rolled at Meal Times through the Hospital Wards. Heating Current is Turned On Whenever Stops are Made

## PHYSICIAN MAKES VISITS IN AIRPLANE

The country doctor's traditional horse and buggy have been replaced for the first time by an airplane. The Nebraska physician, who is believed to be the first in the world to make professional calls in this way, purchased the plane, primarily, because of the impassable condition of the country roads. It is of the type used by the government for training purposes, and will be flown by a former air-service officer until the doctor himself becomes proficient in the care and operation of his machine.



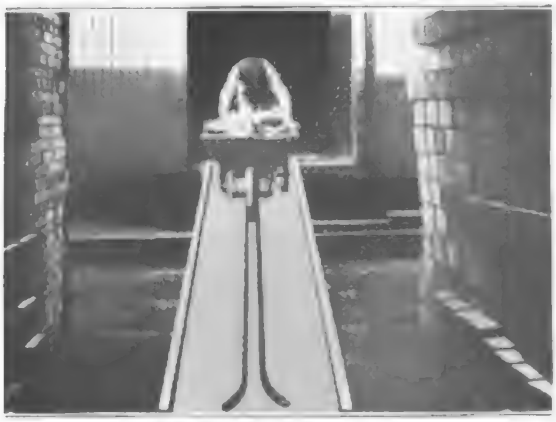
This Is the World's First Airplane to be Used by a Physician in Making Regular Professional Visits. The Inserted Portraits Are of the Doctor and His Neighbor, a Former Air-Service Officer, Who will Teach Him to Fly

## TOWN QUICKENS CIVIC PRIDE BY SALVAGING OLD HOUSES

"A little town with a big idea" describes Wellington, an ambitious Kansas municipality, that has determined to rid itself of every unsightly property within the city limits. The townspeople realize that nothing deadens the neighborhood and civic pride more than the familiar run-down, ramshackle residences, sometimes on the best streets, which are commonly the product of the owner's neglect and the public's indifference. They have consequently resolved on a different policy for their town. They have raised a fund with which they will first buy these tumble-down properties, then remodel the houses, sod the lawns, and even lay out small gardens. When the property is again a thing of beauty and an asset to the community, it will be sold to some family which will take pride in the pretty home, and prevent another lapse into ugly disrepair.

## STEEL RAILS GUIDE BARROWS DOWN SAFETY RUNWAY

A safety wheelbarrow runway has been adopted by one manufacturing company,



The Small Steel Rails Guide the Wheelbarrow down the Center of This Unloading Runway. Wooden Strips along Both Edges Give Additional Protection

to facilitate the unloading of its freight cars. Three heavy planks are battened together, side by side, to provide a broad, firm surface for the incline; while the safety feature is secured, in part by wooden strips that border both edges of the runway, but chiefly by two flanged steel rails that guide the barrow wheel down the center of the incline. For use when the descent becomes too steep, the company provides a similar, shorter section that may be linked to the end of the first, the junction being supported by a small wood trestle.

## ANCIENT MADAGASCAR EGG IS RECORD BREAKER

The æpyornis was a rare old bird. He flapped his rudimentary wings several centuries ago, on the island of Madagascar, off the east coast of Africa, where he sometimes grew to a height of 12 ft., in appearance not unlike the modern ostrich. Among fossil remains on the island has been found this egg in the illustration.

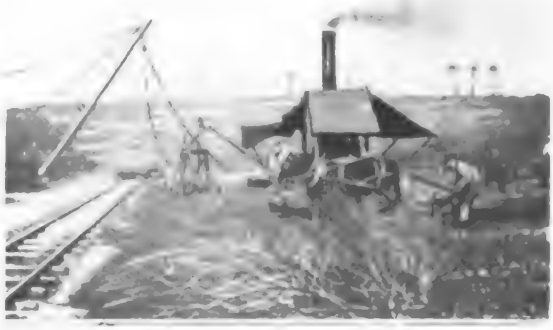
The Egg of the Æpyornis, in the Center, is Computed to Be 150 Times as Large as That of the Hen, and Six Times the Size of an Ostrich Egg

It is about six times as large as that of the ostrich, with an armor-plate shell ⅛ in. thick. In circumference it measures 2 ft. 8 in. one way, and 2 ft. 2 in. the other.

## AN AMERICAN STEAM SKIDDING MACHINE IN FRANCE

As a rule the lumber industry of France is characterized by the use of hand labor almost entirely. Logging is done with mule teams and two-wheeled carts, the sticks being hoisted into the carts by hand. Of course, before the war labor was much cheaper than machinery and power, so the methods were perfectly justifiable from the French point of view.

When the American army forestry troops entered the woodlands of that country to cut timber for our tremendous building projects, they carried with them American machinery of all kinds, even steam skidding engines, such as shown in the photo. The French foresters would not permit the use of such machines on



American Timber-Skidding Plant Erected in France by American Army Forestry Troops

steep hillsides, where the tearing away of soil would bring about erosion, but down in the sand-dunes country, south of Bordeaux, where the results of erosion could not be of greatly damaging nature, they were allowed, and the one shown herewith was installed. The manner of installing was similar to those in use in the big timber of our western coast country: three sheaves located so that the line formed a triangle, with a hauling cable of 1-in. steel running in toward the engine, and a rehaul of ⅝-in. cable attached to the end of this to carry it back for another load each time. Thus, by using two drums, the line was made to seesaw back and forth, bringing several logs at a load, and doing away with the need of working horses or mules on the sand dunes.

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## MYSTERIOUS VOLCANIC ACTION STUDIED BY METEOROLOGIST

Although the world has been spared serious volcanic disturbance during the last few years, interest in the subject has lately been reawakened by a discussion of the mysterious killing effect often observed when lava and ashes do not even touch the victim. A meteorologist suggests that the explosive expulsion of the lava from the crater generates a tornadolike wave of compression that speeds through the atmosphere in all directions, stifling animal heart and lung action, even disrupting buildings and trees. And in accordance with physical laws, which are easily verified by experiment, this wave of compression is accompanied by a flash of heat, the scientist maintains, sufficiently violent to destroy animal life, and ignite ships in near-by harbors.

¶ Pasadena, Calif., is believed to be the only city in the United States in which every house is wired and connected for electric lighting.

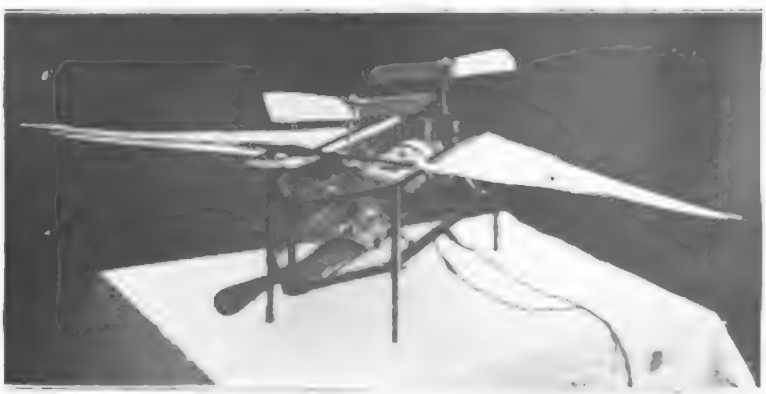
## CULTIVATOR AND HARROW COMBINED IN ONE

Performing in one operation the work of cultivating and harrowing, a new combination farm implement, originating in the state of Washington, cuts a five-foot strip of soil at each trip. The rotary cultivator blades, six on each of two shafts, are driven by a chain from the left-hand wheel, which has a broad traction surface. As the blades revolve forward, the machine runs easily, its weight resting largely upon the traction wheel.

By Revolving the Shovel Blades, the Inventor Makes This Machine a Combined Cultivator and Harrow. The Broad-Tread Wheel at the Left, Which Bears the Weight of the Machine, Runs the Blades by Chain Gear

## HELICOPTER AIRSHIPS STILL INTEREST INVENTORS

Experimental airship models, called helicopters, designed to rise from the ground by the action of horizontally revolving propellers, have actually flown years before the airplane was dreamed of. A toy model was demonstrated by two Frenchmen in 1784; another steam-driven machine is said to have flown across two large fields in 1842. And today, regardless of the airplane's remarkable development, many inventors are still busy with machines of this type. The designer of the model in the illustration has so much confidence in his ship that he plans to commence manufacture on a modest scale. It would be instructive to learn what happens when the motor stops in actual flight.



This Little Airship Has Propellers for Both Horizontal and Vertical Flight. The Adjustable Wings have been Added by the Inventor to Secure Stability

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# EXTERNAL FEATURES THAT MARK THE CHARACTER

The Big Double Bird Cage Is the Feature of This Pergola-and-Arbor Entrance to a Beautiful Summer Garden on a Southern California Estate. The Cage Construction Is Simple and Inexpensive, but Its Inmates —Canaries, Doves, and Linnets — Furnish Rich Entertainment

This Handsome Well, on a Dixie Highway Farm, Cost Its Owner About $65, but It Is So Attractive, Compared with Ordinary Farm Wells, That Many Tourists Stop, and Then the Farmer Sells Them Some Honey

The Roof Garden on Top of This Concrete Garage, on a Los Angeles Hillside Lot, Has a Brown-Stained Pergola Hung with Rose and Ivy Vines, and a Floor Adorned with Potted Plants

Modeled after a Japanese "Torii," or Entrance to a Sacred Place, This Gateway to a Florida Estate Is of Wood, Painted and Sanded to Resemble Cement. The Seats and Lanterns Inside the Gate, and the Posts Outside, Are Concrete. Palms Line the Pathway to the House



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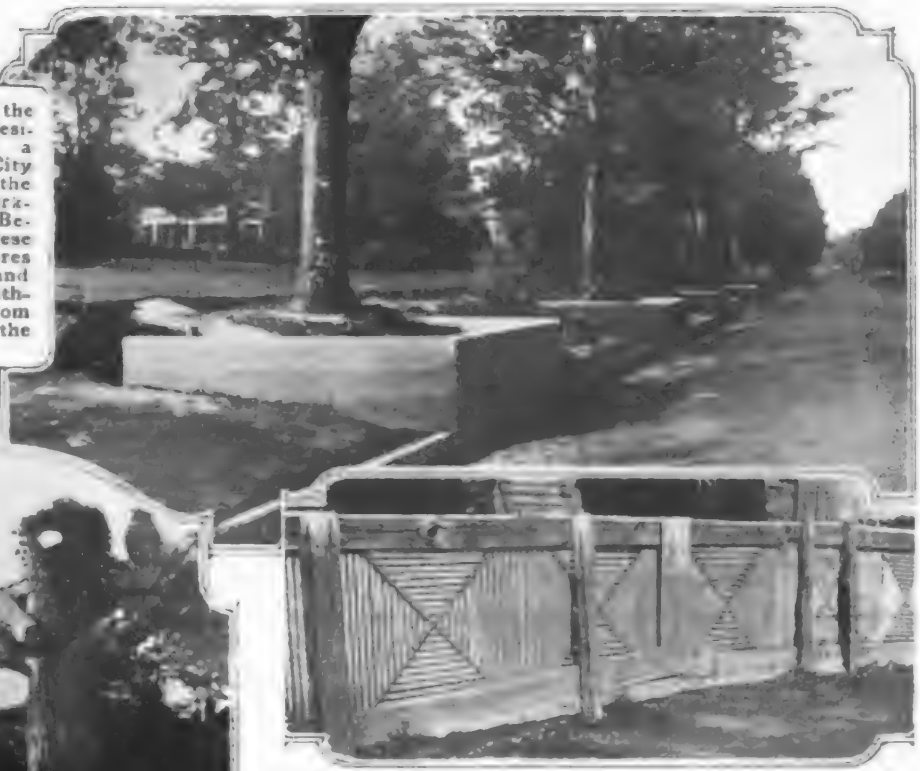

Regrading Some of the Streets in a Fine Residence Section of a North Carolina City Threatened to Kill the Trees along the Parking, as the Roots Became Exposed. These Concrete Inclosures Solved the Problem and Saved the Trees, without Detracting from the View down the Street

Discarded False Flooring from Street Cars Built This Peculiar Fence, Whose Owner was Actuated by Motives of Economy Rather Than Originality

A Large University Substituted This Arrangement for the Usual Unesthetic Danger Sign at Railroad Crossings. Lights in the Roof are Reflected on the Sign at Night. The Roof Is Moss Green and the Rest Dark Brown

The Naturalistic Logs of This Garden Entrance Are Concrete, Tinted, and So Is the Big Owl Perched Above, but the Latter Has Glass Eyes, Which Are Illuminated at Night. This Is a California Idea

The Porch Pillars Are the Novel Feature of This California Home. They Are of Dark-Red Brick with a Two-Inch Cement Trim, Which Extends About Two Inches. The Flower-Holder Openings, About 30 Inches High and 12 Square, Have Cement Shelves to Match, as Has Also the Coping of the Porch Wall



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## MOTOR "COP" HIDING IN BOILER CAPTURES MANY SPEEDERS

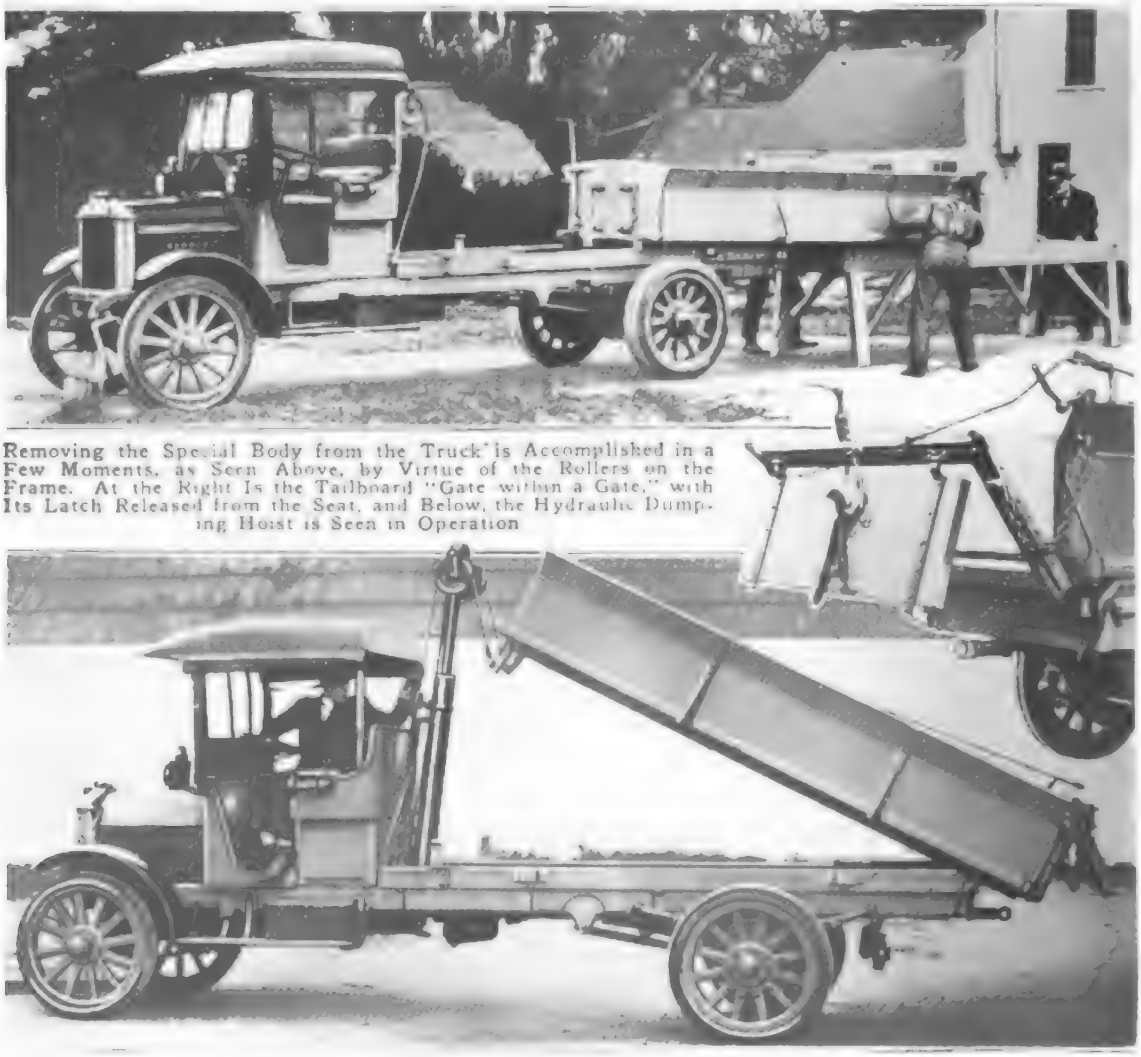
In one week, 202 speeding motorists on Mission Road, at Los Angeles, Calif., were

From His Lurking Place in This Old Steam Boiler, Accommodating Him and His Machine, the Motorcycle Policeman Sees the Highway without being Seen, and Catches Many Speeders

arrested by a motorcycle policeman who apparently materialized out of thin air. His well-chosen hiding place was a big abandoned boiler in a vacant lot, which afforded sufficient room for the machine as well as its rider.

## BODY ADAPTED TO MANY USES IS SPECIAL TRUCK FEATURE

To perform effectively the miscellaneous tasks of a large estate, a motor truck was recently provided with a special body combining delivery and dumping types, and removable for carrying cumbersome loads on the flat bed. The zinc-plated steel lining is leak proof. The tail gate contains another gate, hinged at the top and released from the seat, for spreading gravel or sand. A hydraulic hoist raises the front end for dumping, or may be used with cables to assist heavy loading. Rollers on the frame, supporting the body, make it easily and quickly removable. A spring drawbar eliminates shock in hauling work.



Removing the Special Body from the Truck is Accomplished in a Few Moments, as Seen Above, by Virtue of the Rollers on the Frame. At the Right Is the Tailboard "Gate within a Gate," with Its Latch Released from the Seat, and Below, the Hydraulic Dumping Hoist is Seen in Operation

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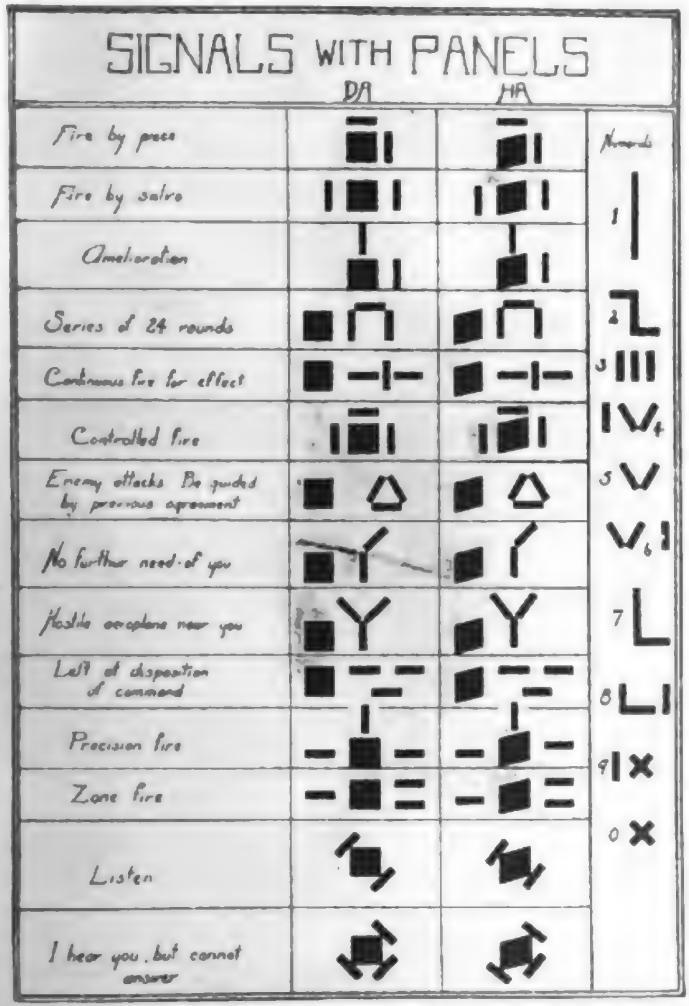
# TRAINING THE AERIAL OBSERVER

By PERCIVAL E. JACKSON

*Ex-Lieutenant, American Air Service, A. E. F.*

THE American army had its choice, when America entered the war, between the French and British military systems then in vogue. Just as unity of command was then lacking, so too was there no uniformity of tactics in numerous important respects. Salient among these, were the differences between the French and British systems of artillery fire. The British, using a firing map divided into lettered and numbered divisions and subdivisions, covered with projectiles and shattered beyond repair the entire zone in which their particular objective was situated. The French, on the other hand, employing a firing map using the Lambert system of projections, accurately gauged each shot with respect to the particular target desired, lending to the work a finesse and skill that produced results quite as excellent as those obtained by the British, but with a much greater saving of ammunition. Naturally, the French method required a higher degree of skill in the direction of fire—and this was found most easily achieved by the use of aerial observation. With the French, in consequence, the aerial-observation squadrons were highly trained and developed, and when the Americans chose to use the French method of fire, they likewise borrowed their instructors and devices in order to bring their aerial observers to a high stage of efficiency.

In the training of observers, map reading, of course, is of prime importance. In action, the trained observer actually thinks in terms of the signs used on firing and other maps, so ability to read a map as easily as a printed page is the first thing required.




**These Artillery-Adjustment Ground Panels are Made of White Canvas and are Displayed on a Dark Background, near the Guns, for Communication with the Adjusting Airplane. The Larger Panels Are 18 Feet Square and Serve to Identify the Battery Firing (Divisional or Heavy Artillery, etc.); the Smaller Are About 18 by 3 Feet and are Placed in Various Combinations to Indicate the Commands Given**

In the illustration are shown some of the panels used on the ground by the batteries, in communicating with the observer in the plane. The observer sends his directions down by means of wireless. It was highly essential that both pilot and observer be thoroughly conversant with the panel signals, for often there would be enemy planes in the vicinity, and a more than momentary flash of the panels would reveal the location of the battery to the enemy. The panels were made of white canvas, so as to be easily seen against the dark background of the earth.

It is a fact that the first panel signal a pilot and observer became acquainted with was the one meaning "No further need of you"; the first display of which usually found the observer wirelessing back "Am going home," while the pilot made tracks for the aerodrome.



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## SAFETY TURNOUTS FOR ROADS NEW GRADE-CROSSING PLAN

When the path of a speeding automobile is suddenly crossed by a railroad train, the driver generally turns the car to the right into the ditch, the fence, or whatever happens to border the highway at that point. Statistics show more casualties resulting from this natural action than from collision with the train itself. The proposal of a southern road commissioner calls for a strip of smooth roadway running alongside the railroad at each grade crossing for 100 yd. or more. It would join the right side of the highway in a broad curve, banked to prevent overturning of a suddenly swerved car. This simple and comparatively economical expedient, with the clearing of vision lines at least 100 yd. back from each approach, would, it is estimated, save a majority of the incautious drivers who now come to grief in their conflicts with locomotives.

Proposed Grade-Crossing Arrangement, Giving a Speeding Automobilist a Chance to Turn Hurriedly to the Right When About to Run into a Railroad Train

## MECHANIC EMBROIDERS MAP OF THE UNITED STATES

After working in his spare time for two years, a mechanic and designer has completed an unusual task. Upon a strip of linen, 7½ ft. long and 4½ ft. wide, he has embroidered in colored silks a large American flag. In the center of the flag he has worked a map of the United States, with coastal waters, lakes, and rivers in light blue, state capitals in dark blue, and the states themselves in half the colors of the rainbow. The coasts are well protected by a battleship on the west and a small fleet in the Gulf of Mexico, all shown in careful detail.

This Elaborately Embroidered Strip of Linen was Made in Two Years' Spare Time by a Nimble-Fingered Mechanic. He Worked 574 Skeins of Silk Thread into the Various Designs

## MAKE TIN FOIL IN CHINA BY PRIMITIVE METHODS

In China the natives still make their tin foil by the most primitive methods. Pieces averaging 1¼ by 2 in., cut from thin castings of tin, are piled on granite, 210 deep; the reason for the particular number is not apparent to the occidental eye. This pile is hammered down, and another placed on top of it, and so on until the stack is 3,360 sheets deep and about 12 by 24 in., padded with leather at the bottom and waste foil at the top. Heating the aggregation at intervals prevents sticking. The sheets are finally cut in three pieces and beaten to about 13 by 18 in. The Swatow district uses some 700 tons of tin a year for this purpose, each 100 lb. producing 60 to 70 lb. of foil, or a total annual output approximating 450 tons.

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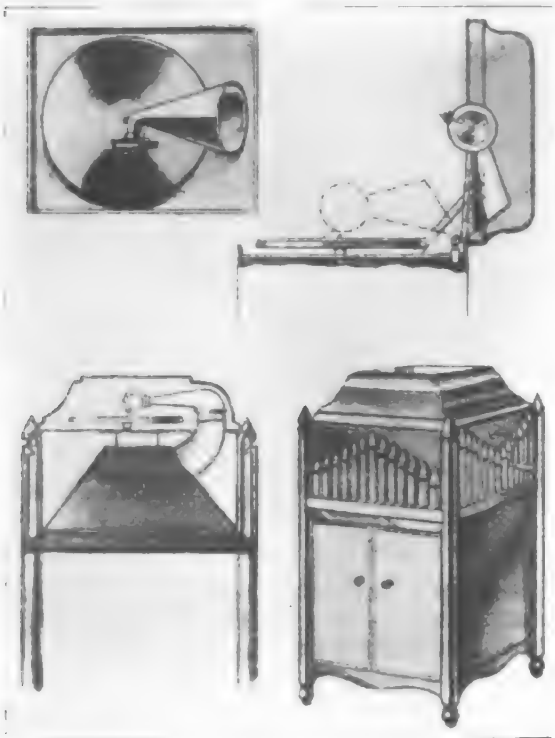
## INVENTORS PATENT TWO UNUSUAL PHONOGRAPHS

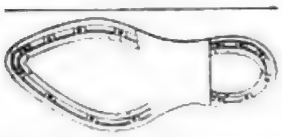
In the ordinary talking machine the sound waves travel from the reproducer, through the movable arm, to an amplifying horn in the body of the machine. In an odd design of recent patent, however, the movable arm is enlarged, and itself becomes the horn. In another, equally curious, the sound waves are led from the amplifying chamber in the cabinet through miniature organ pipes ranged around the sides. It is not known what merits are claimed for these machines by their inventors.



**The Upper Phonograph Combines Movable Arm and Amplifying Horn. In the Lower Arrangement the Sound Waves Pass through Miniature Organ Pipes**

## STRIPS APPLIED TO SOLES PREVENT WEAR ON SHOES

To save wear on shoes, a New Zealand inventor provides an attachable wearing strip, applied like a border around the sole or heel. It may be bent to fit any shape of shoe. A longitudinal channel down its center holds sliding washers, and screws through these fasten the strip.



## STEAM BATH MAKES IRON PROOF AGAINST RUST

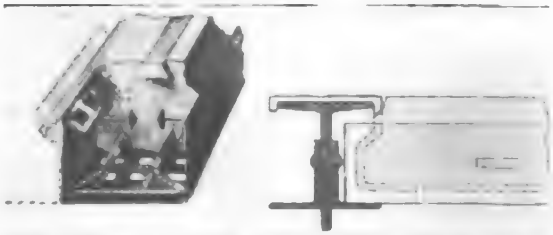
By subjecting iron at red heat to the action of superheated steam, a European scientist is said to obtain a product that is not attacked by rust and corrosion, and is therefore particularly desirable for bridgework and other exposed construction. The protective value of this oxidized coating depends both on the temperature of the steam and on the length of the treatment. Thus, exposed for five hours at 260° centigrade, the coating is said to withstand the action of emery paper for a considerable time; while a rise in temperature to 650° centigrade and an increase in time of treatment of six or seven hours, yields a coating that will withstand the action of a file.

## VETERAN CAVALRYMAN RIDES DESPITE LOSS OF LEGS

Strollers in the Bois de Boulogne, just outside of the old "enceinte" of Paris, France, were recently surprised to see a legless horseman cantering along the bridle path, accompanied by a mounted attendant. The rider sat upon a sidesaddle, to which he was secured by a strap around his waist. Friends who recognized him as an old cavalryman were quick to applaud his pluck in overcoming his handicap.

## REINFORCED-CONCRETE UNITS FOR BUILDING FLOORS

For the convenient and rapid laying of concrete floors, and other structural surfaces, an eastern architect has devised a system of reinforced-concrete units, which may be cast anywhere and used when needed. Each unit is full span length, the ratio of length, width, and depth being approximately 16, 2, and 1. Bottom, sides, and ends of each unit are inclosed in a sheet-metal trough, with a perforated bot-



**Left View Indicates How Concrete Unit is Cast in Metal Trough with Interlocking Flanges. A Wood Strip for Nailing is Seen Molded in the Unit. Use of Reinforcing Member as a Hanger is Seen at Right**

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tom to expose a concrete furring surface, and shaped edges to interlock with the filling and with adjacent units. End extensions of the reinforcing bars support the units in the structure.

## NATION'S SUPPORT PROMISED FOR EMPLOYMENT PROGRAM

As a result of a searching investigation made by the director of the Council of National Defense, it has been revealed that every city and state in the union is willing, and in most cases prepared, to aid the council's Emergency Committee on Employment. Not a single state, county, or community wishes to shirk this important phase of peace-time reconstruction. With these encouraging assurances behind him, the director is delegating 35 army officers to various parts of the country where they will make every effort to coördinate all this enthusiasm in a definite program that will abolish unemployment.

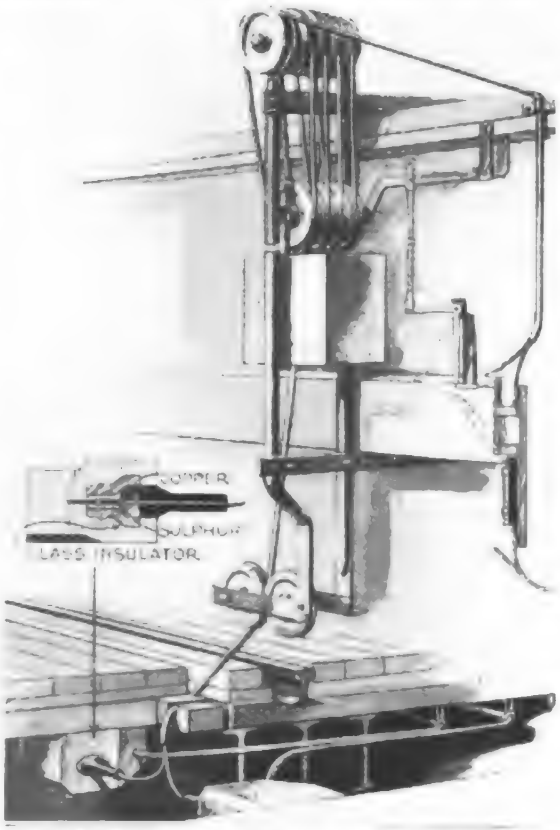
## DRAWBRIDGE SUFFERS IN COLLISION

Two powerful tugs recently attempted to guide a newly launched vessel through the open draw of a heavy railroad bridge at Aberdeen, Wash. The tide caught the vessel, however, ramming it into an adjacent stationary girder which it forced five feet out of line. The ship was practically undamaged, but rail traffic over the bridge was made impossible for six weeks, necessitating a detour over another line. Another result of the mishap is a suit for $21,000 damages, filed against the local shipyard by the Director-General of Railroads.

**A Vessel Struck and Bent This Heavy Girder Instead of Passing through the Draw**

## AMERICAN ABILITY IN FRANCE SOLVES DOCK-CRANE PUZZLE

When the only available materials must be picked out of a junk pile, making electrical connections for a traveling crane




**Flexible Electric-Cable Connection to a Traveling Crane, Made Out of "Junk": Sectioned Insert Shows How Concrete, Glass, Sulphur, and Copper Made an Efficient Junction Box with a "Fool-Proof" Plug**

using 550 volts from a 12,000-ampere cable is quite a large order. That is what American mechanics did on American docks in France. The feed cable was run over sheaves made of concrete, reinforced with ½-in. mesh wire, bushed with pipe, and running on roller bearings fashioned from wire nails. At the end of travel, a counterweight on the cable tripped an iron lever and opened the switch. For each junction box a topless glass insulator was buried in concrete, its copper sleeve fastened with cast sulphur. The wood-handled plugs were so shaped that the copper blade could enter the box only in the right position, preventing arcking. Sheave supports were made of iron pipe.

¶Army airmen and airplanes are prohibited by a recent ruling from further participation in exhibitions for purses or individual prizes.

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# BOYS AND GIRLS NEVER HAD WIDER INTERESTS

This Little Foundling Buffalo Calf was Reared in Alberta, Canada. When Local Shriners Went on a Pilgrimage to Buffalo, New York, They Put a Fez on His Head and Took Him Along

The Girl is Handing Official Letters to Her Father on the Occasion of the First Flight Made by an Airplane of the New York Police Reserve Air Service. The Letters were Carried to Philadelphia

These Schoolhouses on the Sunny California Beach Shelter 50 Pupils, Who Find Study Difficult at Times, as the Pacific Ocean is Less than 20 Yards Away

Posters Like This Teach the Little Folks in Belgium That the Shells and Fuses They Find along the Roadsides and Half Buried in the Fields Make Dangerous Playthings

Each of These Smiling Fathers Carried on His Back the Finest Boy or Girl in the World during a Specialty Race Held at a Municipal Picnic in City Park, Cincinnati. The Judges Couldn't Decide Who Became More Excited, Fathers or Children



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## THAN IN THE PRESENT COLORFUL, CHANGING TIMES

Old "Vic" Turns Up a Disdainful Nose at German Sausage. "Vic" Campaigned with the 332nd Infantry in France, Journeyed Back with Them on the Transport, and is Now Trying to Get His Discharge from the Army at a Demobilization Center

This Cincinnati High-School Lad has Built Every One of These Machines Himself—Submarine Chasers, Airplanes, and Racing Car. The Automobile is Said to Travel 70 Miles an Hour although the Wheelbase Measures Only Six Feet and the Motor Has Only Two Cylinders

The First Trees to be Dedicated to the Memory of the Late Theodore Roosevelt were Recently Planted in a New York Park by Boys and Girls Interested in the Planting and Preservation of the City's Trees. These Living, Useful Memorials Are Certainly What the Colonel would have Desired

This Tombstone Marks the Grave of a Loyal and Earnest Boy Scout. When He was Drowned, While Swimming Not Long Ago, His Parents Decided to Bury Him in His Scout Uniform, and to Place above His Head This Enlarged Cast of the Medal He Wore So Proudly

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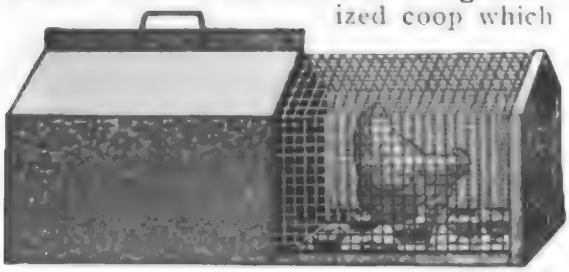
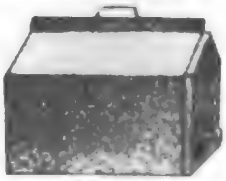
## TELESCOPING CHICKEN COOP ASSURES PROTECTION

Neither rats, hawks, rain, nor snow need ever harm the chickens in a galvanized coop which





This Chicken Coop may be Opened to the Sunlight in the Daytime and Closed at Night against Rain and Snow

is made in two telescoping sections. In the daytime the chicks may safely range on the lawn under the protection of the wire netting, while at night, by telescoping the two sections, the owner knows they are sheltered from the elements. A removable bottom makes cleaning easy.

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It has come to light that the curator of the Louvre Museum carried a $2,000,000 jewel in his vest pocket from Paris, France, to safety at Bordeaux, when the Germans first menaced the French capital.

## GREAT RUBBER SHIPMENT FILLS ENTIRE TRAIN

A monster shipment of rubber recently reached San Francisco from Singapore, Straits Settlements. Loaded on freight cars for its overland journey to an eastern manufacturer, it filled a special train of 26 cars. The shipment weighed 2,240,000 lb., and was part of the great supplies that have accumulated because of the war-time embargo on importations.

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## MAKING AUTOS INOPERATIVE IF SEIZED BY ENEMY

A Belgian mechanical engineer was requested by some of his clients to devise a method whereby their automobiles might be made inoperative, in case of seizure by the enemy, without harming the machines. When the magnetos were of the form having permanent magnets arranged in pairs, he solved the problem by reversing one magnet of each pair. The magneto, thus neutralized, produced no spark, and yet was readily restored to its former usefulness.

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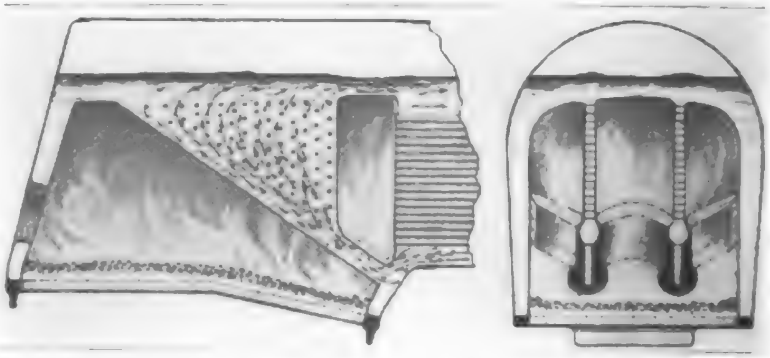
## IMPROVE LOCOMOTIVE FIRE BOX AND SAVE COAL AND WATER

By saving 30.3 per cent in coal and 11.1 per cent in water, a locomotive on a western railroad has just demonstrated that a simple change in the fire box is productive of remarkable results. In non-technical terms, the improvement consists of two hollow partitions, shaped like flattened triangular funnels, which divide the fire box lengthwise. The lower "spout" end joins the throat of the boiler, while the broad upper end is connected to the crown sheet at the top of the fire box. The oblique front and vertical rear edges are closed, allowing the hot gases to circulate around the funnels, or siphons, which are 4 in. thick. This additional circulation of boiler water resulted, by the test, in a 27.92-per-cent increase of boiler efficiency. For economy in manufacture and marketing, each siphon is formed from a single sheet of steel, bent and welded, the elongated throat of which may be cut to fit any locomotive fire box.



Siphons in a Locomotive Fire Box: Left View Is a Longitudinal Section, and Right View a Vertical Section through the Funnel-Shaped Water Walls, Circulation of Water through Which Increased the Boiler Efficiency Greatly. The Black Dots Are Braces across the Tube

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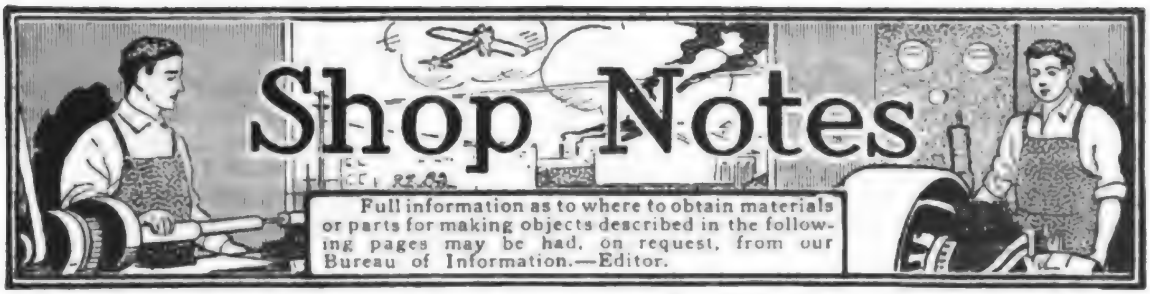


# How to Keep Chair Rungs from Pulling Out

By S. B. ROYAL

IN a large manufacturing plant where many chairs and stools are used, it was found that, among the chairs which were put out of service due to breakage, by far the greater number had suffered from the rungs becoming loose and pulling out of the leg. It is probably true of most chairs that the weakest point is this fastening of the rung in the leg. The plant referred to finally adopted, for all repairs of this kind, a method consisting of springing a steel ring into place in such a way that the rung is permanently held into the leg. The method is shown in Fig. 1, the final position of the rung being seen at the right. It is practically impossible to pull the rung out when it has been correctly fastened in this way; and it is found that chairs thus repaired stay in service until breakage occurs in some other part.

The ring is formed to a diameter, measured on its center line, exactly equal to that of the chair rung. At a suitable distance from the end of the rung a groove is turned in the lathe, of a width equal to the diameter of the wire used in the ring, and of a depth also equal to this same diameter. Inside the rung hole in the chair leg is cut a groove of the same width, but of a depth equal to half the diameter of the ring wire. The ring is sprung into the groove on the rung, which is then forced into its hole. The ring, upon reaching the groove in the hole, springs outward to fit it, and the fastening is complete. It is apparent that a gap must be left in the ring sufficient to permit springing it into the groove on the rung.

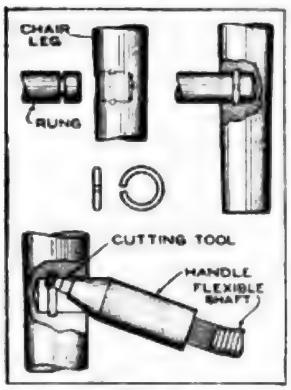

Fig. 1

The making of the metal ring and the rung groove is work which any mechanic can do with common tools, but the making of the internal groove in the chair leg is a job that will require some sort of special tool. In the factory mentioned, a tool was used which was mounted on a flexible shaft, as shown below in Fig. 1. The cutting tool proper is screwed into the head of the flexible shaft. Mounted on the flexible shaft is the handle, with a conical end of suitable proportions. This tool fits into the hole in the chair leg, as indicated, and it is the work of but few seconds to rotate the handle once around the hole, and thus cut the groove.

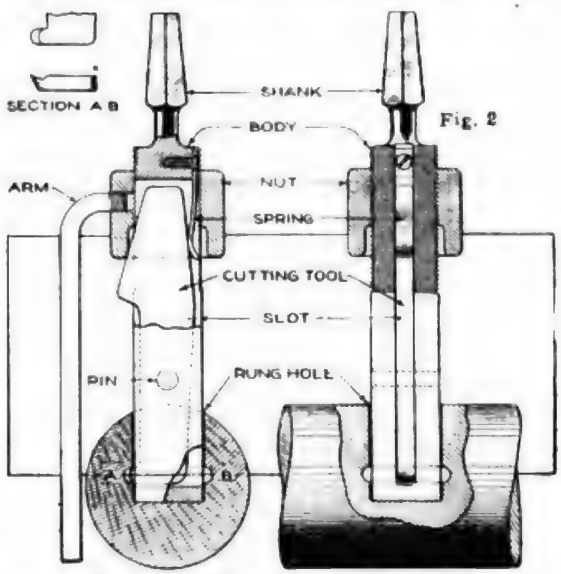

Fig. 2

As the Tool is Revolved by the Brace, Its Body Remains Stationary, but the Cutting Edge is Fed into the Groove

For the repair man who has no power-operated flexible shaft, an excellent tool, which can be used in an ordinary bit brace, is shown in Fig. 2. The body of the tool is made from a piece of soft, round steel of the same size as the chair rungs to be fastened, or slightly smaller. On one end of this bar, a shank is formed to fit the brace. Almost the entire remaining portion of the bar is cut through,



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forming a long slot to take the cutting tool. This is fastened with a single pin, on which it turns freely. Its lower end is formed to cut the groove in the rung hole, as it is forced into the wood of the chair leg by the nut at the upper end. This nut turns on a left-hand thread, cut on the body of the tool. It has a rounded inner surface at its lower end, which comes in contact with the taper side of the cutting tool.

In operation, the shank is turned to the right like an ordinary bit, and the nut is kept from turning by an arm which bears against the chair leg. As the cutting tool is revolved on the pin by the pressure of the nut, the cutting edge at its lower end is fed into the wood, cutting a clean groove. This edge should be of a proper shape for cutting wood, like the detail in the upper left-hand corner of Fig. 2. When the groove is cut to the proper depth, the tool is withdrawn by turning the brace in the reverse direction, and pulling out from the chair leg. It is well, in practice, to note the number of turns necessary to give the brace in order to cut a groove of the proper depth, and then to use this number of turns for each groove. No great harm is done by cutting the groove too deep, if the ring is formed of the proper size, as the rung cannot pull out even if the ring falls out of center. If the tool is made so as to give sufficient motion to the cutting edge, the groove in the chair leg can be given the extra depth, and the one in the rung will then be only half as deep as the diameter of the ring stock. There is but slight advantage in this method, since the cutting of a deeper groove in the rung weakens it but very little, and, in practice, it is found that chairs repaired in the way described, give no further trouble from this cause.

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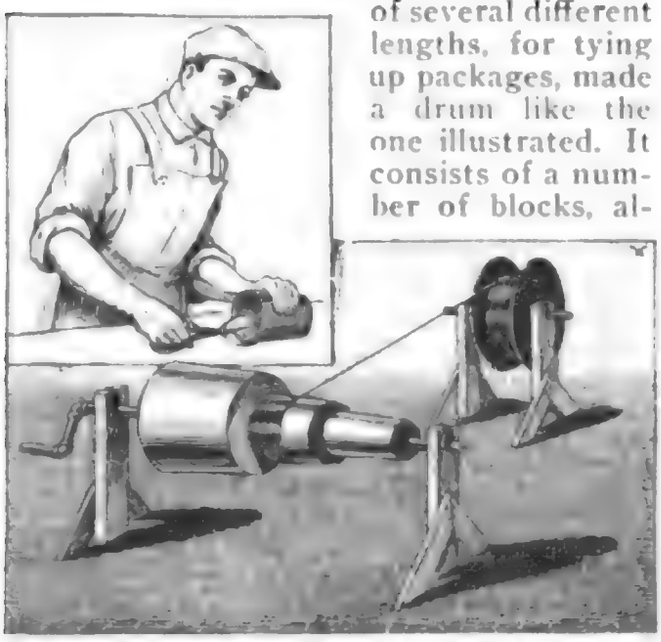
### Drum for Cutting Wire to Length

A concern which used, in its shipping department, a large number of pieces of wire of several different lengths, for tying up packages, made a drum like the one illustrated. It consists of a number of blocks, almost cylindrical, but having a very slight taper, mounted on a piece of iron pipe and soldered to it. The average circumference of each block is just the length that the pieces of wrapping wire are to be. After a sufficient quantity of wire is wound around the drums, the slight taper permits the coil of wire to be readily slipped off. It is then cut through with a pair of shears, converting each turn of wire into a piece of the proper length.—F. W. Smith, Trenton, Tenn.



**A Simple Device, Made of Pipe and Wooden Blocks, Produces Pieces of Wire of Nearly Uniform Length**

### Improvised Wire Drawer Handles

To make a handle for a small drawer in a desk or kitchen cabinet, bend a piece of stiff wire until it forms three sides of a rectangle, one of the longer sides being missing. Then turn each of the short sides outward about ⅜ in. from the end, to make hooks with which the handle can be fastened to the drawer by staples. The latter should be so spaced that there is very little end play, and if the staples are hammered deep into the wood there is no danger of the handle working loose.—Abel Green, New York, N. Y.

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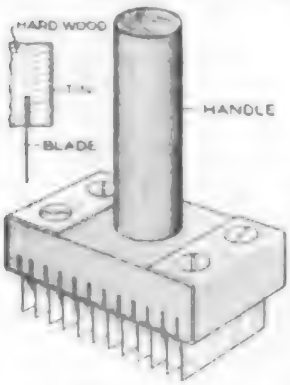
### Concrete Flowerpots

Two pails can be combined to make a form for molding concrete flowerpots. The only necessary condition is that, when one pail is placed within the other so that their vertical center lines coincide, there will be an interval of not less than 1 in. between them, no matter at what point the distance is measured. If it is larger, the pot will, of course, be rather thick at the walls or bottom. Mix a shovelful of cement with twice that quantity of finely sifted coal ashes, and add enough water

to make a loose paste. Put it into the larger pail with the smaller pail above it, keeping the latter one inch above the bottom of the larger pail by hanging it from a horizontal stick supported by two uprights. Before the mixture is dry give the inner pail half a turn so as to keep it from sticking to the cement, and when the material has set, take the pail out and let the concrete harden thoroughly. Then take out the pot and drill a hole in the bottom for drainage.—C. A. Black, Jr., Hightstown, N. J.

### Chopper Made with Razor Blades

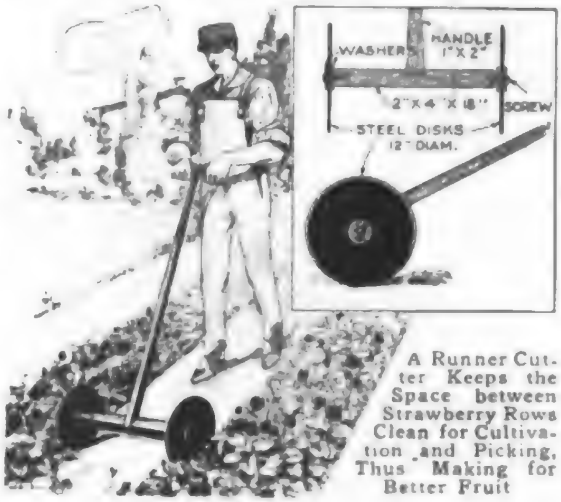
A number of old safety-razor blades may be put to use by being built into a chopper to be used with celery, nuts, or other salad materials. A block of good hard wood, about ½ in. wider than the length of the blade, should have several slots sawed in it, as shown, just wide enough to take the backs of the razor blades. A piece of tin, or other thin sheet metal, is fastened over the block, having slots cut in it which are just wide enough to take the blades, but not the backs. These slots should also be just long enough to take the blades, so that a strip of the solid tin remains at the sides of the chopper. The slots in the tin may be cut with a cold chisel. The tin should be drawn over the block quite tightly and fastened with screws. On account of the probable stretching of the tin, if the cold chisel is used for this purpose, it will be found advisable to complete the slotting in the tin before starting to saw the slots in the wooden block.




### Runner Cutter Keeps Strawberry Bed Clean

Strawberry runners grow into the space between rows, take root, and fill the space with new growth. This not only hinders cultivation, but it makes picking the ripe berries difficult, by leaving practically no room to work in.

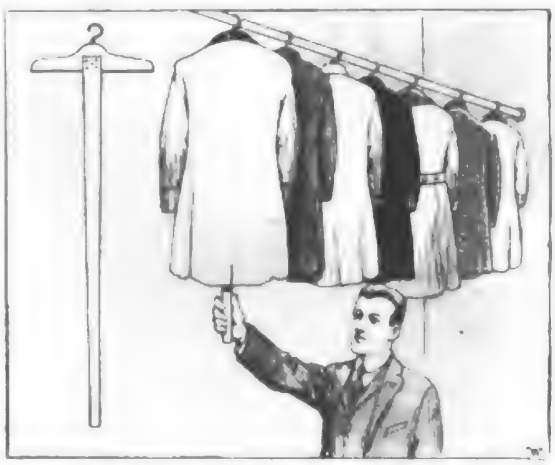
The runner cutter shown in the sketch is pushed along the space between rows, cutting all runners that extend, and thus keeping the space clear. The cutters are disks of heavy-gauge sheet steel with edges filed sharp. These are fastened to the ends of the axle with heavy lag screws, or large spikes. Washers should be placed on each side of the disks so they can turn easily. The handle may be made from a broomstick, or a piece of hickory, 4 ft. long. It takes only a few minutes every other week to run between the rows with the cutter. It is not necessary to remove the dead runners.—J. Horace Van Nice, Chicago, Ill.




A Runner Cutter Keeps the Space between Strawberry Rows Clean for Cultivation and Picking, Thus Making for Better Fruit

### An Overhead Coat Hanger

By hanging garments overhead valuable space is saved in a western factory. The crosspiece is shaped like an ordinary coat hanger, and the handle is about 5 ft. long. Horizontal rods or piping support many rows of these articles, and when garments are damp they are quickly dried in the warm air at the top of the cloakroom.



Clothes are Hung near the Ceiling, by Long-Handled Hangers, to Make Extra Space in a Coat Room

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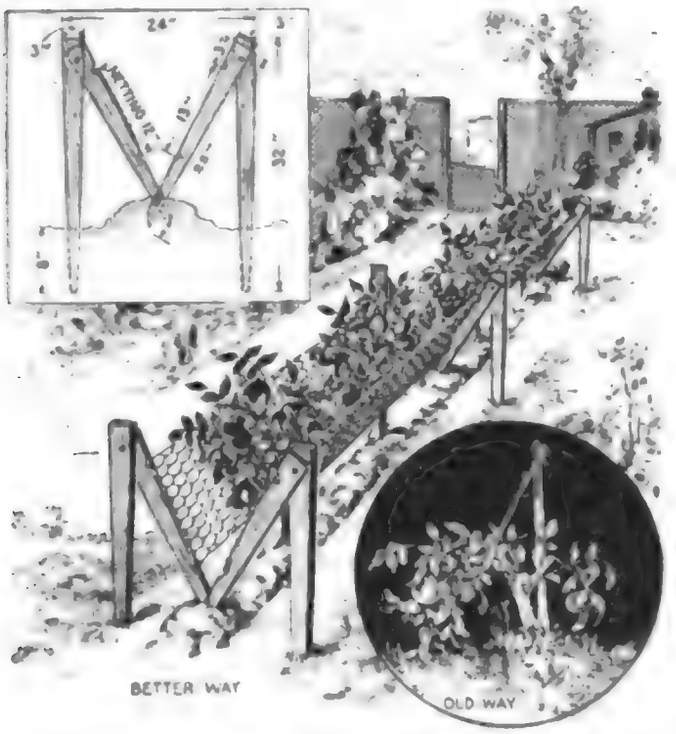
## An Adjustable Garden Trellis

Although many gardeners use some sort of trellis for peas, beans, and tomatoes, they are not, as a rule, carefully made, or permanent fixtures. They may




**An Adjustable Garden Trellis Makes It Possible to Cultivate Longer, and Gives Better Light and Air to the Crop**

even hinder the process of cultivation, and generally become useless before the harvest season is ended.

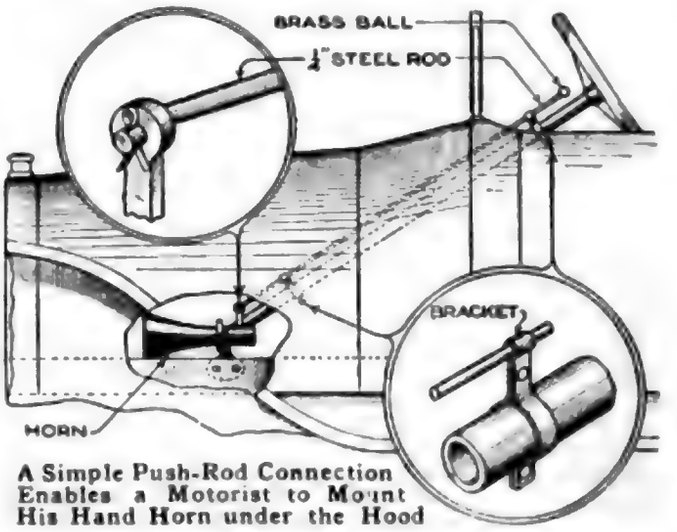
The drawing shows a simple trellis, designed to avoid most of these faults. It consists of several adjustable supports, and two lengths of wire poultry netting. The supports can be folded, and the wire can be rolled so that it is possible to put up or take down the trellis very quickly, and but little space is required for its storage. In spite of this feature, the trellis is sturdy, holds the foliage off the ground, makes it possible to cultivate the plants easily, and at the same time gives free access to the air and light, which is essential if the best results are to be obtained. This is especially true of tomatoes, which ripen more quickly, and form more perfectly, if they have plenty of air and light, and are not rotted by being hidden under a mass of wet foliage. Since the trellis holds the vines out of the dirt, the crop is not spattered with dirty water, and is therefore kept cleaner.

Each support of the trellis is made of four pieces of 1-in. lumber. Large cotter pins are used for pivots at the three points. Notches are cut in the inner edges of the V-pieces, to hold the poultry netting. To set up the trellis, push in the stakes, spacing the supports from 3 to 4 ft. apart in the row, depending on the crop. Stretch lengths of 2-in. mesh poultry netting, 12 in. wide, along each side, fastening it by catching its edges in the notches of the V-pieces. For ease in handling, no strips of netting over 25 ft. long should be used.

If there is a tendency for the trellis to sag later in the season, due to the weight of the crop, sticks may be placed horizontally to hold the supports apart, and kept from falling by wire hooks and screw eyes.—Geo. Motzer, Ionia, Mich.

## Automobile Hand Horn Mounted under Hood

A hand-operated automobile horn has the merit of reliability. The simplicity of its construction reduces to a minimum the chance of its getting out of order, whereas the operation of an electric horn is complicated by the presence of other than purely mechanical factors. But as an electric horn is controlled by a wire and push button, it can be mounted in any position relative to that of the operator, whereas a hand horn, which is worked by moving a lever back and forth, cannot be mounted at a distance without some additional equipment for transmitting the mechanical power necessary to operate it. Since a visible horn is apt to mar a car's appearance, the owner of a machine mounted his hand horn beneath the hood on one of the frame members, and connected the lever to a ¼-in. steel rod, which he attached to the steering column by two brackets made of 1-in. strip steel. The top of the rod




**A Simple Push-Rod Connection Enables a Motorist to Mount His Hand Horn under the Hood**

was threaded so that a 1¼-in. brass ball could be screwed on to it for a handle, and the lower end was bent at a right

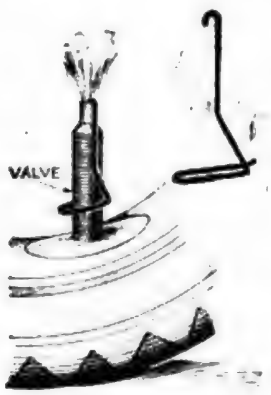
angle and passed through a hole drilled in the horn lever, where it was secured with a cotter pin.—G. A. Luers, Washington, D. C.

### Enlarging Holes with a Punch Using Original Centers

In steel-plate work, it occasionally happens that holes are accidentally punched too small. The laborious process of reaming can be avoided by punching the holes again, but it is necessary to use caution in preventing the new holes from being punched off center. The old punchings, if not lost, can be replaced in the holes, and the original centers used in locating the new ones.

### Wire Holds Tire Valve Open

It usually takes some time to let the air out of an inflated tire. The wire tool shown in the sketch holds the tire valve open, allowing the air to escape, and the motorist's hands are free to do other work while waiting for the air to be exhausted. The tool is simply a short piece of stiff wire with a hook on one end to hold the valve open, and a loop on the other end which catches on the threads of the valve stem.—F. E. Schmidt, Ocean Springs, Miss.




### Removing Paint from Clothes

Treating a paint stain with a solvent does not necessarily remove it. Unless some method is used of taking it entirely away from the stained surface after dissolving, it merely spreads over a larger area. To remove paint from cloth, lay a pad of blotting paper on the side of the material on which the paint fell, and rub the other side gently with a soft piece of flannel dipped in chloroform or benzol, both of which are paint solvents. As the paint dissolves it naturally passes into the most aborbent material in contact with it—which is the blotting paper—not into the adjacent cloth. Deep stains can be completely removed by this method.

### Idle Sprocket Keeps Drive Chain from Flapping

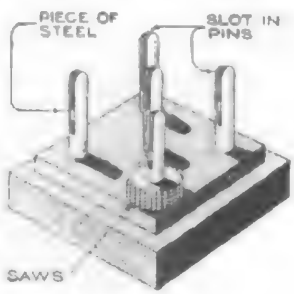
Where long drive chains must be used to transmit power, idle gears like the one

**The Idle Gear Rolls Peacefully between the Sides of the Chain, but It Keeps the Chain from Flapping**

shown in the accompanying photograph are useful in preventing undue flapping, and the consequent tendency of the chain to ride up on the sprockets and run off. With such a gear, chain adjustments to compensate for wear are reduced to a minimum. On very long chains, several idle gears might be used without undue sacrifice of power.—John E. Hogg, Alhambra, Calif.

### Rack for Small Circular Saws

A tool-crib man, whose duty it was to take care of a large number of small circular saws, giving them out to the machinists as required, found that a rack like the one illustrated saved a great deal of his time. The rack consists of several pieces of drill rod, slightly smaller than the center hole of the saws, mounted in a wooden block, with slots sawed down their centers. Small pieces of steel separate the two prongs of each rod very slightly, so that the saws will not drop off if the rack is knocked over. They can be pulled off with the fingers by exerting a little force which springs the prongs in slightly. The ends of the prongs must be well rounded off, so that the saws can be quickly replaced.—Peter Dyer, Jr., Fall River, Mass.

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# An Automatic Refrigerating Machine for the Home

By KENNETH M. COGGESHALL

HOME refrigeration, so necessary for keeping foods in hot weather, has, until recent years, been entirely dependent on ice, which was often frozen from water of questionable purity. In commercial practice, direct refrigeration by gas expansion has gradually replaced ice-cooling, and with the development of the

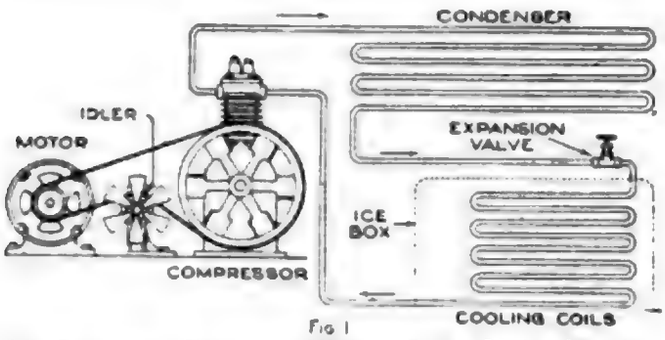



FIG 1

**The Different Elements Which Go to Make Up the Refrigerating System are Shown in Outline in the Diagram, without Any Attempt at Accurate Representation**

modern machinery for the purpose, it is entirely within the ability of the home mechanic to assemble and install a cooling system, which will operate with very little attention. For this type of outfit electricity for power is essential.

The principle on which expansion-refrigerating systems work is that when a gas under pressure is allowed to expand, owing to the pressure on it being reduced, it absorbs heat from the surrounding substance, or, in other words, "radiates cold." When the gas is first placed under pressure, it becomes hot, and it is first necessary to let this heat radiate off, in order that the gas when expanded will do efficient cooling. A simple diagram of the apparatus necessary for these operations is shown in Fig. 1.

Gases which have been used for expansion-cooling systems include ammonia, carbon dioxide, sulphur dioxide, and others. In commercial machines ammonia is the favorite. Carbon dioxide, if used at a very high pressure, is also an efficient medium. As high pressure is out of the question in a homemade apparatus, and as ammonia must not be brought into contact with brass and copper, the medium which is here recommended for use is sulphur dioxide. This gas can be purchased in small cylinders, and besides acting as heat absorber, it lubricates the compressor to such an extent that internal oiling is unnecessary.

### Motor and Compressor

The electric motor should be of ¼ hp., 1,750 to 1,800 r.p.m., equipped with a flat or crown-face pulley, 3 in. in diameter by 1¾-in.-face. As noise is an important factor, as quiet-running a motor as possible should be procured.

Great care must be exercised in the selection of the compressor, which should be of the air-cooled type. The cylinder bore should approximate 1⅝ in., although any size up to 2 in. is permissible. The stroke should not be over 2½ in., and 2 in. will be sufficient. The compressor should operate at best efficiency between 500 and 700 r.p.m.; thus the pulley, or flywheel if it serves as a pulley, should have a diameter of 9 or 10 in., to allow the proper speed reduction between the motor and compressor. Many air compressors are equipped with a safety valve, or "unloader," which automatically relieves the back pressure against the piston when the former reaches any predetermined limit. With a motor of only ¼ hp., there is little possibility of the gas pressure reaching the danger point. The valve should, therefore, be disconnected, to prevent the gas from escaping.

Since the driving motor must be located quite near the compressor, efficient power transmission requires that the belt be provided with an idler, or tightener. This device should be furnished by the compressor manufacturer. If possible,

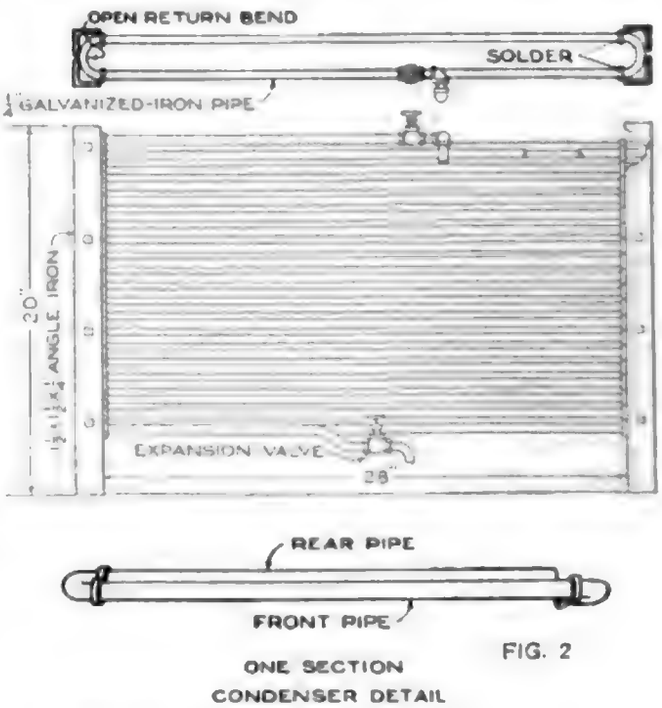



FIG. 2

**The Condenser, Made of Iron Pipe, Is the Means by Which the Heat is Finally Radiated Off into the Atmosphere**

six 5-in. fan blades should be secured to the pulley in such a manner that, as the moving belt turns it, a small volume of air will be kept in circulation past the condenser coils.

### Condenser

To remove the heat produced in the gas by compressing it, it is held for a time in coils of pipe outside the refrigerator. A general view of this condenser is shown in Fig. 3, while the details are seen in Fig. 2. Forty lengths of pipe, threaded at each end, are required for the condenser, as drawn. Galvanized-iron "open return bends" are used to form a spiral of pipes, 20 sections high. Each section is made as detailed, and they are joined as indicated in Fig. 2. As each section is added, the joints are heated with a blowtorch, a touch of acid is added, and solder is sweated around the edges to fill every possible avenue of escape for the gas. All joints must later be tested under pressure. The condenser-pipe spirals are supported as indicated in Fig. 2. The open pipe in the top section should be shorter than the others; a ¼-in. valve should be screwed on and the joint soldered. This valve is connected to the compressor during final assembly.

The expansion valve, seen in Figs. 1, 2, and 3, is a very important part of the system. After the hot gas has been cooled and liquefied in the condenser, the fluid is allowed to pass through this valve in a small stream which rapidly expands to a gas. Either a globe or gate-type valve may be used, but it must be a good one; it must be located as near as possible to the actual cooling coils, since the refrigerating effect begins immediately on the low-pressure side of this valve.

### Cooling Coils

The cooling, or expansion, coils, seen in Fig. 3, are rather more difficult to construct. Rather than make these of galvanized-iron pipe it is better to get annealed copper or brass tubing of ¼-in. iron-pipe size in long lengths. There will then be few places where two tubes must be connected, and compression couplings may be employed here to advantage. The form of these coils shown is intended for a refrigerator having an ice compartment, about 11 by 14 in., and 12 in. deep. Eight sections of tubing, such as detailed, will be required. Besides these a rest is formed from the tubing below the coils, on which a shallow pan of water may be placed when ice is required. The outlet of the cooling coils passes up through the top of the refrigerator, and is connected to the intake of the compressor. The entire set of coils is supported by two narrow brass strips, which pass around the coils and fasten to the top of the ice compartment.

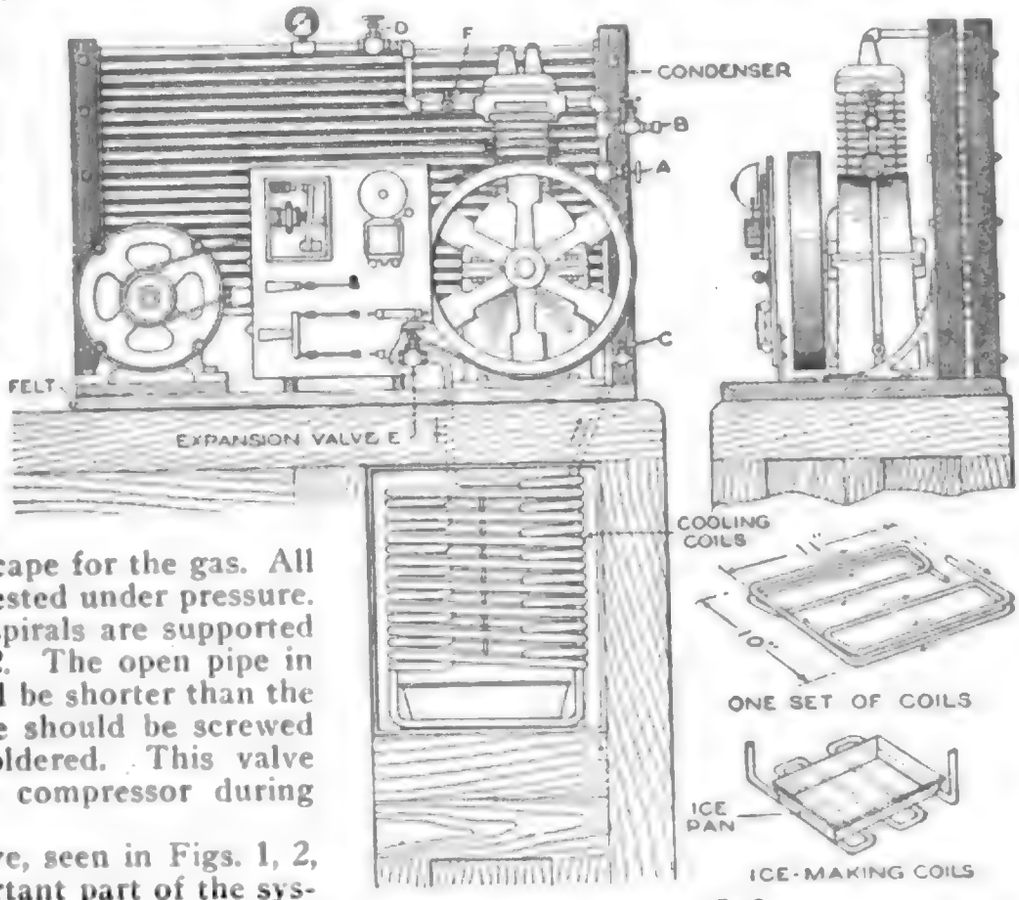



Fig. 3

**Assembly View of the Refrigerating System: The Position of the Various Valves and Air Cocks is Shown, as Well as the Construction of the Cooling Coils**

### Thermostatic Control

It would not be efficient or economical to keep the compressor in operation all the time. Foods are best preserved when the temperature is cool and constant—it should be kept preferably between 45 and 50° F. in the food compartment, and should not rise above this, nor should it fall to the freezing point. With the aid of a few simple electrical devices, the temperature may be maintained practically constant at all times. The diagram of the entire electrical circuit is shown in Fig. 4. A thermostat, placed near the cooling coil, can be so adjusted that when the temperature rises to a predetermined point, an electric circuit is established through a relay, which in turn operates to connect the driving motor with the outside current supply. After the refrigerating machine has operated for a suffi-

cient time to allow the temperature to drop to the desired point, the thermostat breaks the relay circuit and the motor stops. As a precaution, however, against some part of the relay system failing to

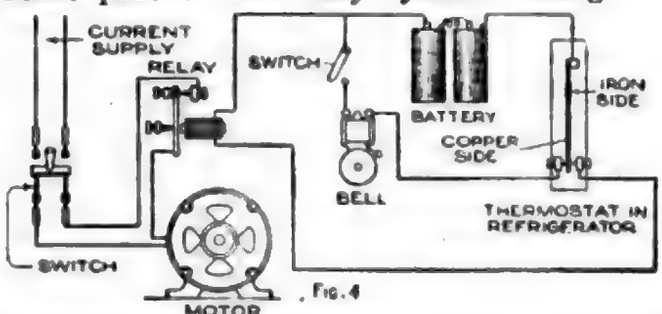



Fig. 4

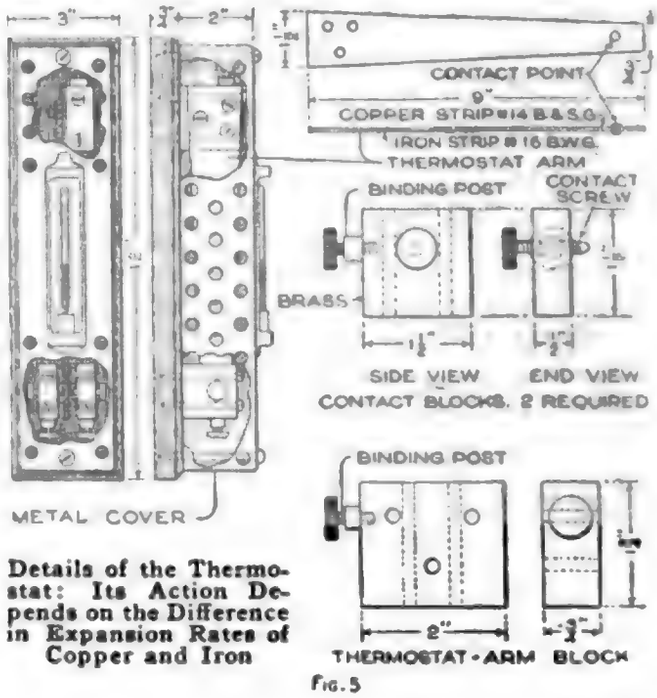
**The Electrical Diagram Shows the Method of Starting and Stopping the Motor by the Action of the Thermostat**

function, thus allowing the apparatus to reduce the temperature in the refrigerator to a point where the food is in danger of freezing, provision is made so that in such an instance the thermostat will cause an alarm gong to ring.

The ordinary thermostat is founded on the principle that different metals have different rates of expansion with temperature. If, for instance, a strip of copper and one of iron are soldered together, and one end held rigid, the other end will bend toward the copper side when cooled, but toward the iron side when heated. Thermostats for this purpose can be purchased, or can be made from materials easily obtained. Fig. 5 shows a thermostat so constructed. The principal parts are detailed at the right, and the manner in which they are put together is shown at the left. The contact points on the strips may be made by setting through each a copper rivet, or bits of special alloy wire made for contact points can be soldered on. Similar points may be soldered on the ends of the contact screws, but this is not necessary, as the circuit breaks so seldom. Some kind of protecting cover should be made from sheet metal to fit over the thermostat, and should have holes punched in it to allow circulation of air. It is handy to fasten a thermometer on the cover to serve as a guide while making adjustments.

### Relay Switch

While the current required to drive the motor is small, on account of high voltage, it is not advisable to use the light contact points on the thermostat to make and break the main circuit. A relay switch thus becomes necessary. One which is suitable for this use can readily be purchased, or can be made as shown in detail in Fig. 6. The electromagnet can be taken from a large electric bell, or telephone instrument. It should have quite a strong pull in order to insure good operation. The electromagnet must be held very firmly, and may be set into the slate panel slightly, if it is a very heavy one. Connections are made as shown in Fig. 4. The wires leading to the electromagnet are not shown in Fig. 6; the wires from the main circuit should be connected to the two binding posts shown. One of these binding posts is connected to the relay arm by a piece of flexible stranded wire, or "pigtail," which should be soldered to both the binding post and the relay arm. Considerable movement must be allowed on both the stop screw and the tension screw. The two carbon contacts, which are cut from old arc-light carbons, should be held tightly together whenever current is flowing through the electromagnet. To insure this, the carbons must be so adjusted that there is considerable space between the electromagnet core and armature, when the carbons are in contact. The tension screw may be merely a machine screw threaded into a small brass block. One end of the spring is soldered to the screw so that, as the screw




**Details of the Thermostat: Its Action Depends on the Difference in Expansion Rates of Copper and Iron**

Fig. 5

is turned, the tension is increased. The other end of the spring may be soldered to the relay arm, or held by a small cotter pin.

### Final Assembly

On the electric control panel board, which may be of slate or wood, assemble the relay, the battery switch, the supply-circuit switch, the necessary fuses, and a good, loud electric bell, to serve as an alarm.

The baseboard for the complete refrigerating machine, 2 by 18 by 31 in., will, of course, be built up of a number of smaller boards glued and screwed together. Several layers of felt should be placed between the board and refrigerator, to deaden the noise and vibration. At the back of the board, as shown in Fig. 3, is assembled the condenser; it is held in an upright position through the aid of iron brackets fastened between the angle irons and the baseboard. In front of these coils, from left to right, are placed the motor, the fan and idler, and the compressor. The three are belted together. The cooling coils are suspended in the ice compartment, the inlet pipe at the top being connected to the upper valve, while the outlet at the bottom is connected to the intake side of the compressor. In this latter pipe line, however, is a valve A. Above A is a tee connection to another valve, B. This valve will remain tightly closed after the system has been charged with gas. Below B is a small air cock, C, whose use will be described later.

The exhaust side of the compressor is connected, by ¼-in. pipe, to a valve, D, which is similar to A. Both these valves will remain wide open and will require no adjustment after the system is charged. In making these several connections, a number of couplings, reducers, tees, and unions are required. If desired, a pressure gauge, registering from 0 to 100 lb., may be put in the condenser circuit. The switch panel is situated conveniently near the front and center of the board. The thermostat is placed in the food compartment, and all electrical connections are made according to Fig. 4. It is best to use rubber-covered wire for the electrical circuits.

### Operation

The machine is now ready for test. Open all valves; if all bearings have been properly oiled, start the motor, and notice whether the apparatus runs smoothly. With B still open, close C and A. Air will be drawn in through B, and the entire system will soon be under pressure. As the pressure increases, watch the joints for leaks. Apply soapy water with a small brush to all points where a leak is suspected. Bubbles will indicate escaping air. Steps must be taken to repair all defective joints, as an imperfectly sealed system is incapable of the delicate adjustments necessary to secure correct regulation.

After making certain the coils are airtight the system must be charged with the gas. Anhydrous sulphur dioxide may be secured in 6-lb. drums; this will be a sufficient quantity for a charge. Close valves D and B, and the air cock C; valves A and E are open, as is also the air cock F. Run the compressor for a time,

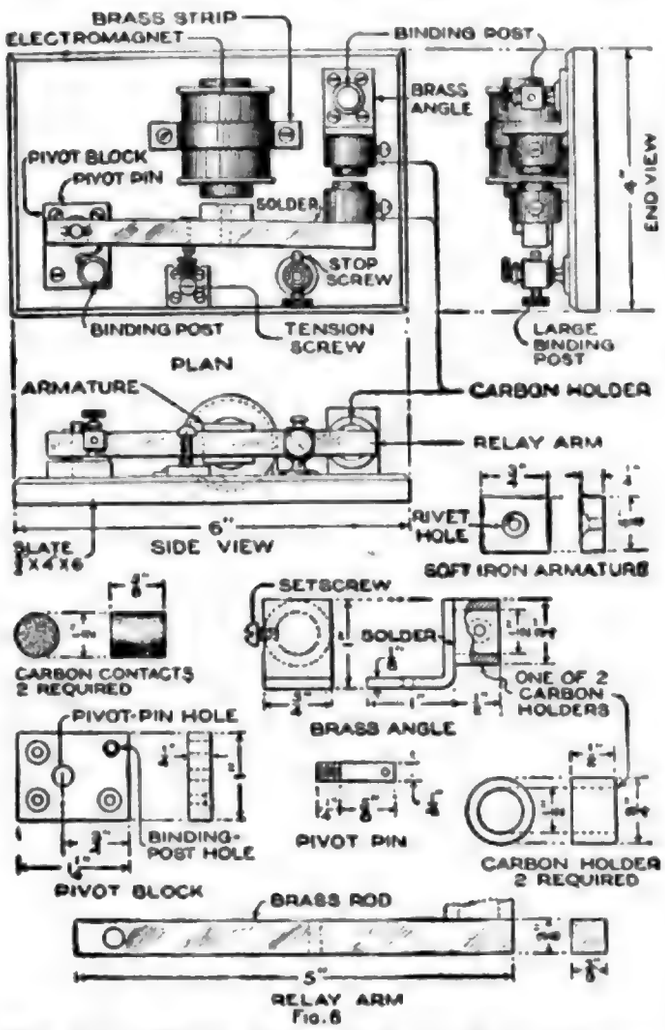


Fig. 6

**The Relay Switch, Operated by the Battery Current through the Thermostat, Makes and Breaks the Motor Circuit**

so that as much air as possible will be pumped from the pipes and expelled through F. Meanwhile, the outlet to the container of the gas is connected to the union attached to valve B. Quickly close F and A, and open D and B. The refrigerating fluid will be pumped in through the compressor to the condenser. Open cock C to allow the air to escape which is being replaced by the gas; close it when the gas appears. When the system is charged, close B and disconnect the empty gas drum. It should never be necessary to recharge the machine if B, C, and F are kept tightly closed so the gas cannot escape. Both the valves D and A will now be kept permanently open, no further adjustment being necessary after the system has been charged.

While the compressor is running, adjust the expansion valve E. No definite

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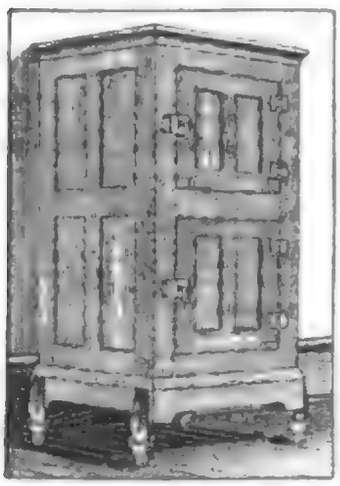
directions can be given for its manipulation. Endeavor to obtain a setting which produces the maximum cooling effect in the expansion coils. Watch the action of the thermostat, and compare it with the thermometer readings. Make adjustments of the contact points until the relay is connected in the circuit when a thermometer placed in the food compartment shows a rise to 50° F. On the other hand, the thermostat should release the relay and allow the machine to stop when the temperature in the same section has dropped to about 45° F. If about 1 in. of water is placed in the ice pan, it will freeze, provided the machine is allowed to operate a sufficient time to bring the surrounding air to the freezing point. After the system is once adjusted, it should require no attention aside from occasional oiling of the moving parts.

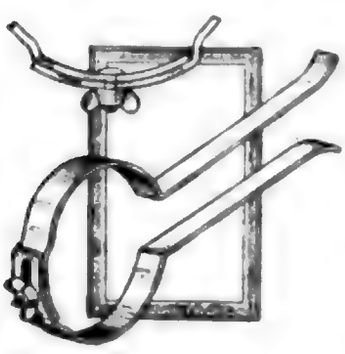
### Glass Insulators Keep Insects from Refrigerator

An efficient method of keeping ants, and other insects, out of the refrigerator is to mount it on legs made of common telephone-line insulators, screwed on the brackets made to be used with them. The hollow part of the glass insulator is then filled with some liquid, like kerosene or turpentine, which the insects will not cross. Another advantage of such legs is that they are adjustable in length, so that the height of any one of them can be changed slightly to make the ice box stand steady on the floor.—J. G. Zimmerman, Chicago.



### Adjustable Tongs for Holding Piston Rings

The tongs illustrated can be used on various sizes of pistons by loosening the wing nut, fitting the tongs over the piston, and again tightening the nut. One of the members of the tongs has a long slot cut in it, while the other has only a hole for the screw, or bolt, on which the wing nut is placed. Both members should be slightly offset, as shown, to give clearance for the head of the bolt.—L. B. Robbins, Harwich, Mass.



### Carpenters' Squares Useful for Measuring Distances

A little ingenuity is sometimes necessary in measuring distances between shafts and other parts of a plant installation. Intervening gears, frame members, and other obstructions, may prevent a scale or tape from being stretched across the space to be measured, but a pair of carpenters' squares will solve most of these problems, if a very slight knowledge of geometry is applied.

In Fig. 1 of the illustration, the vertical distance between two shafts is measured without the aid of a level or plumb line, although the center lines of the shafts are not in the same vertical plane.

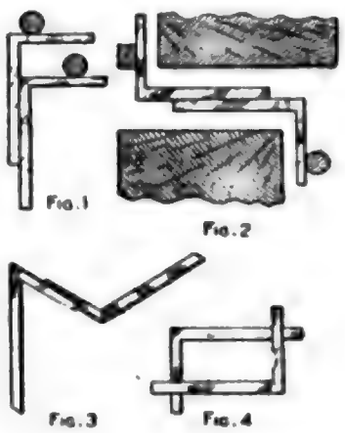



Figure 2 shows a method of overcoming a difficulty caused by two obstructions which prevent measurement from being taken more directly.

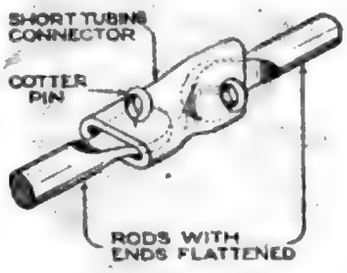
In Fig. 3, the edge of one square is held against the flat of the other, a convenient arrangement when conditions are a little complicated, as when it is desired to find the vertical or horizontal distance between points on flat surfaces which are not in parallel planes.

Figure 4 shows how a rectangle may be formed, by holding the tongues and blades of both squares against corresponding graduations on each.

In all these cases the length of the distances measured is of course limited by the size of the squares, but when yardsticks, straightedges, and additional squares are used, the most difficult conditions can generally be overcome.—J. E. McCormack, Haliburton, Ont., Can.

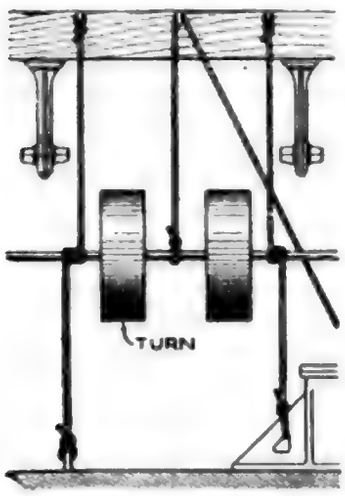
### Universal Joint for Light Connections

Very little equipment is needed in the construction of a universal joint, strong enough to be used on light rods and shafts which are not subjected to much strain. Flatten the two rods at the ends which are to be connected. Cut a piece of tubing, 2 or 3 in. long, and flatten both ends in such a way that the longer diameters at the respective ends will be at right angles to each other. Insert the flattened ends of the rods at the opposite ends of the pipe, and drill a hole at each end, passing through both pipe and rod. The holes should be just large enough to admit cotter pins, which are afterward inserted, and the joint is then complete. It is necessary, of course, in selecting the tubing, to find one which will allow the rods sufficient side play after connections have been made.—G. A. Luers, Washington, D. C.



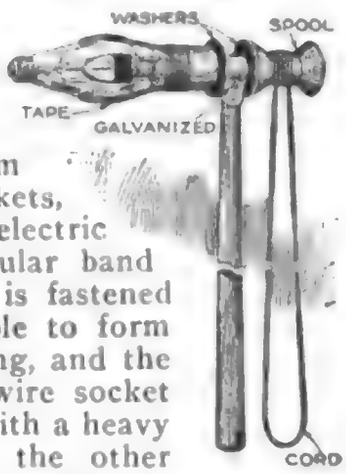

### Heavy Countershaft Raised without Tackle Blocks

A heavy countershaft had to be hoisted into its position near the ceiling, and no tackle blocks were handy. The diagram shows the method by which this was accomplished. The countershaft was laid on the floor beneath its hangers, and ropes were fastened tightly around both ends, as indicated. The workmen then took hold of the near side of the pulleys on the countershaft, and pulled down, thus rotating the countershaft. As the rope was wound around the shaft, the latter was thus slowly raised into position. To prevent any chance of an accident caused by a loosened hold on the pulleys, the shaft was held from falling by another rope tied to the middle of the shaft and caught around some fixed object in the shop.—Edw. M. Davis, Philadelphia, Pa.




### Tool Removes Incandescent Lamps

The spring socket made of wire loops, with which incandescent lamps are removed from high ceiling fixtures, needs extra equipment when the globes are to be removed from high horizontal sockets, such as those in electric signs. A semicircular band of galvanized iron is fastened to the top of a pole to form a bracket, or bearing, and the shaft holding the wire socket is run through it, with a heavy spool attached to the other side of the bearing. Strong cord, or fishline, wrapped around the spool, turns the wire socket and unscrews the globe.—William Freebury, Buffalo, New York.




### Platform to Avoid Treading in the Garden

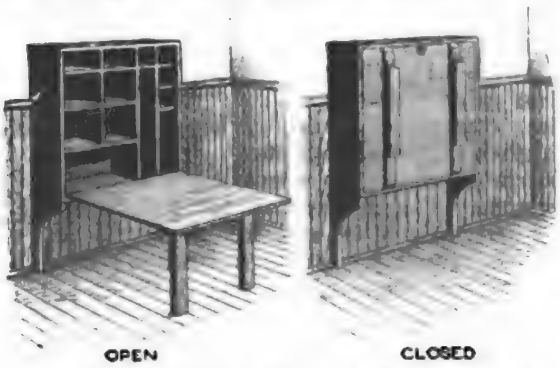
To form a platform, by means of which a gardener can avoid treading on the soil, a plank can be rested on two inverted flowerpots. The gardener stands at work on the improvised bridge, moving it from place to place as required.

### Rubber Shaving Brush

To lighten his traveling kit, a tourist made a shaving brush out of a 10-cent rubber sponge. He divided it across the middle with a knife and used one of the halves, squeezing part of the material where the cut had been made until it was narrow enough to form a handle, after which he wrapped it tightly with fish cord. The other end, which had now become heart-shaped, made a convenient surface for applying lather, and the fish cord wrapped around the handle kept the material inside it completely rigid. In addition to its extreme lightness, the brush had the advantage of being thoroughly sanitary and free from anthrax germs, which sometimes infect bristle brushes.

### Folding Bench and Tool Box

Time consumed in carrying tools between locker and bench, when simple jobs are being done, is saved if the tool box




**A Bench and Locker Combined Reduce the Time Required for Transportation of Tools**

is equipped with a combination bench and door, attached by hinges to the bottom. Legs are placed at one end only, as the other end is supported by the box; these will be strong enough if made of 2 by 3-in. lumber and fastened by small hinges to two braces, or cleats, which run the length of the bench. When the box is closed, the legs fold up against it and take up very little room.—Dale R. Van Horn, Lincoln, Neb.

### Aids in Photographing Machinery

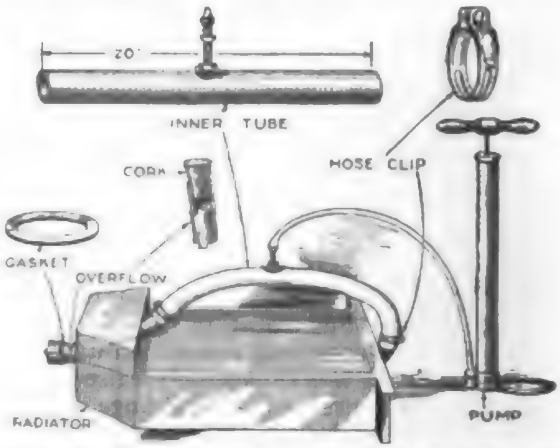
The advertising value of half-tone illustrations in machinery catalogs depends so much on the expensive retouching process that it pays at times to lay color on the machine itself, particularly when it is too large to be moved into a position where the lighting will guarantee a good negative. Only gray paint is used, and if applied in varying shades it gives complete definition to surfaces lying in different planes which would otherwise blend on reproduction, yet does not impart an illogical appearance to the shadows. The color should be laid on immediately before the plate is exposed, so that it will not have time to be defaced by finger marks, and when removed immediately afterward, it gets no chance to dry. Instead of coating the surfaces the outlines may be strengthened with chalk, whitening high lights, emphasizing name plates, and making the retoucher's work extremely simple or absolutely needless. On very large machinery the eminences and depressions are capable of individual illumination with incandescents, but the lamps must be carefully kept out of the field of view. Even with these aids to clear definition, the work should be done when the sunlight is strongest, and all windows behind the subject should be completely screened.—Adapted from British Journal of Photography.

### Strength of Concrete Increased by Rodding

The strength of concrete is much impaired if entrapped air and excess water are not given some artificial means of escape while the material is setting. The process called "rodding" is the most effective. An iron rod worked up and down in the mixture makes passages which provide an exit, the operation being repeated until the material is too firm to permit its continuation. Experiments have been made with concrete containing about six sacks of cement per cubic yard mixed with about 10 per cent of water, and the result showed an increase of 100 per cent in strength. A laboratory test was also made, showing that, after seven hours of the treatment, specimens of concrete developed enough strength in 28 days to resist a weight of 4,644 lb. per square inch, whereas exactly similar specimens of the same age, which had not been rodded, could not resist a weight of more than 1,962 pounds.—Jack Rodolph, Austin, Texas.

### Testing Repaired Auto Radiators

A dependable test of a repaired automobile radiator can be made by using part of a discarded inner tube with the valve




**Air is Pumped into an Automobile Radiator Immersed in Water, and Rising Bubbles Show the Presence of Leaks**

stem attached. Cut a circular gasket from another part of the tube, place it under

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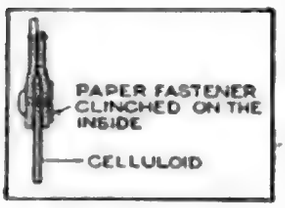
the radiator cap to make an air-tight joint, and plug the overflow pipe securely with a small bottle cork. Attach the tube with hose clips to the inlet and outlet nozzles. lay the radiator in a large tub of water so that it is completely covered, and inflate the tube sufficiently to cause a slight pressure in the radiator tubes, but not enough to injure them. If there are any leaks in the tubes, they can be located by rising bubbles, as the air has no other means of escaping if the other exits have been made air-tight. Mark the leaks with chalk, or with small pieces of wire twisted around them, and, after soldering, replace the radiator in the tub for another test. One or two repetitions of the process will be sufficient to detect all the leaks, no matter how small.

### Paper Clips Fasten Windows in Auto Tops

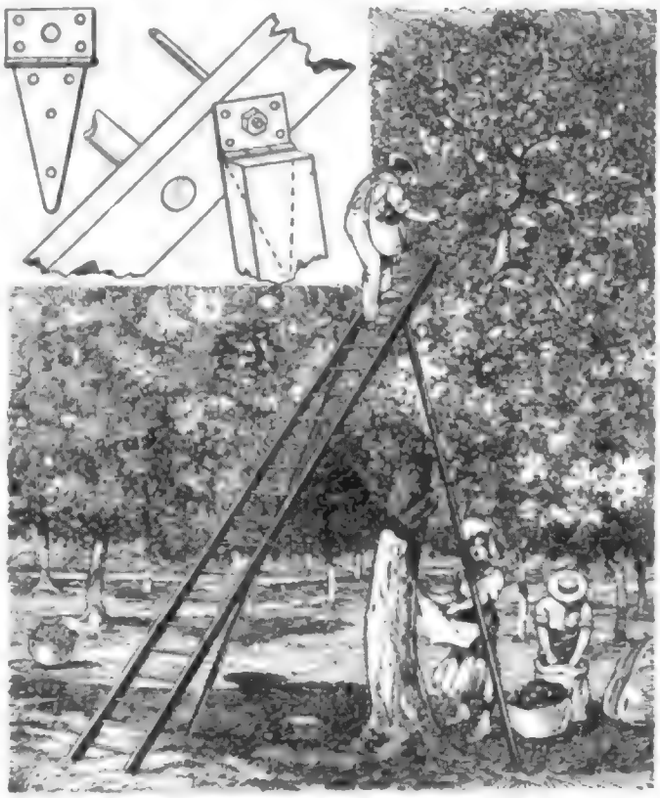
Stitching a new celluloid window in the curtain of an automobile top is a long and tedious job, and demands the services of two persons. Their labors will be much reduced if they use ordinary paper clips. The new piece of celluloid should be cut to the size of the old, and the edge slipped into the slot between the curtain and the reinforcing border, after the inner row of stitches has been removed. Punch holes with a pocket-knife through the celluloid and cloth, and pass the clips through from the outside, clinching them on the inside. The heads of the clips are then painted with enamel of the same color as the cloth.




### Self-Supporting Ladder Useful for Picking Fruit

A ladder which does not depend on the limbs of the fruit tree for support will soon save its small cost in fruit which would otherwise be damaged by being bruised or shaken off through the use of an ordinary ladder.

The device is made from a common ladder of appropriate length, by the addition of two hinged legs. These are provided with sharpened points at the bottom (preferably pieces of iron screwed on), and the feet of the ladder must be similarly sharpened. A pair of hinges of the type shown have their long ends screwed to the upper ends of the legs, and the butt ends of the hinges have a hole drilled in the center to take a long ½-in. bolt. The



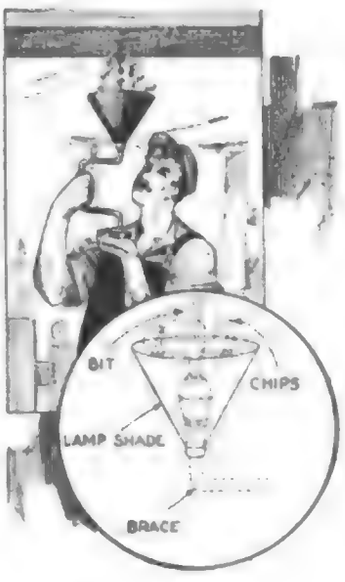
**The Fruit-Picking Ladder is Supported Somewhat Like a Stepladder, but Has Greater Stability, Owing to the Legs Spreading Apart at the Bottom**

nuts on the ends of this bolt must be locked by riveting or some other means, so that they will not come off, but will still allow the legs to be folded up parallel with the ladder when not in use.

By varying the position of the legs, one may reach any part of a fruit tree, especially the outer ends of the higher branches, which are difficult to get at with ordinary ladders.—George E. Walsh, New York, N. Y.

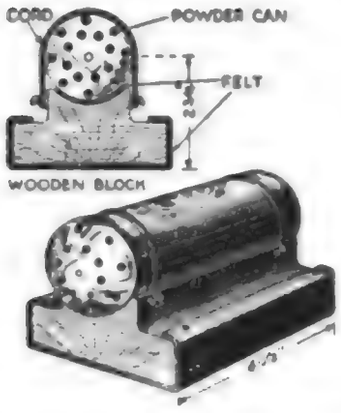
### Chip Catcher on Bit Brace

Among a carpenter's troubles may be counted the annoyance of having chips and sawdust fall down upon him when using a brace and bit over his head. A lamp shade attached to the brace will catch them, and, if not too large, will not prevent the carpenter from seeing how his work is progressing.



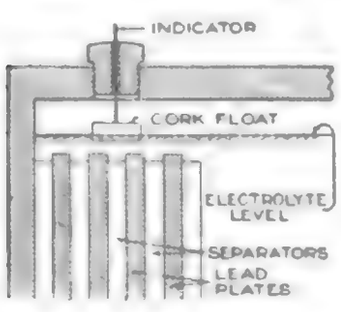
### Draftsman's Powder-Can Holder

If the cloth, or pad, which is used to rub powder on the surface of tracing cloth, is combined with the powder can, the two will always be found together, and this will eliminate one of the small inconveniences well known to draftsmen who work in large departments. A wooden block should be hollowed out a little to make it fit the convex surface of the can. An elaborate job is not necessary, and the work can be done with an ordinary pocketknife. Elastic bands have been used to fasten the wood to the can, but as the latter does duty as a handle, it is better to attach wire, or cord, to wood screws, or nails, driven into the wood on both sides of the can. The block should then be padded with cloth or felt. A blackboard eraser, already padded, makes an excellent block on which to mount the can.—E. A. Van Deusen, Charlotte, N. C.



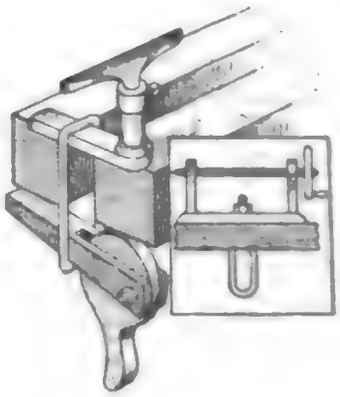

### Float Indicates Level of Storage-Cell Electrolyte

Filling the several cells of his storage battery to the proper level with distilled water is one of the periodical tasks of the motorist. If the level is allowed to fall too low, serious danger to the plates may result; but sometimes the motorist may drive many days, or weeks, without appreciably lowering the battery level, while again a long, hard drive in one day may cause considerable evaporation of the water. It is thus advisable to inspect each individual cell quite frequently. Ordinarily, this is done by removing the cap of each cell and looking at the liquid below. The procedure takes some time, and is rendered unnecessary by the device illustrated. This is merely a float, made of a flat piece of cork, with a rod running upward, consisting of a piece of small-diameter graphite, taken from a hard lead pencil. This runs up through the vent hole in the cell cap. When cut off to the proper length, the stems of graphite will form indicators to show whether the battery cells are in need of more water. A good way is to adjust the length of the stems so that when the float is resting on the plates, the top of the indicator will be flush with the surface of the cell cap. Then notice the height of the indicator exposed when the battery cell is full, and the state of the cell can afterward be judged by a glance at the indicator.—Leon A. Haloin, Denver, Col.




### Levers Replace Nuts on Lathe

The time required to loosen and tighten various nuts and hand screws on a lathe amounts to a considerable total. Some of this can be saved on wood-turning lathes and speed lathes by using cam tighteners, where practicable, instead of screws. In the illustration, the lathe rest is clamped tightly by pushing down on the cam lever at the bottom, and is quickly loosened by pulling forward and up on the cam lever. The eccentricity of the pivot hole in the cam is exaggerated in the drawing, to make clear the working of the cam lever.—T. J. Hubbard, Mendota, Illinois.



### Dressing for Auto Tops

Automobile tops made of artificial leather are apt to crack, if the castor oil used for flexibility dries out of the composition. The result is a leaky top, and some of the varnish gums on the market do not always make the repair job a permanent one. A reliable preparation is made as follows: Mix 1½ oz. of castor oil with ½ gal. of solvent made of equal parts of amyl acetate and denatured alcohol; dissolve in this 4 oz. of colorless transparent-celluloid clippings. If the top is to be colored black, add aniline dye soluble in alcohol. The celluloid clippings can be obtained at any automobile-repair shop, where this waste accumulates. A reasonable degree of caution must be exercised in handling the chemicals, as they are highly inflammable.

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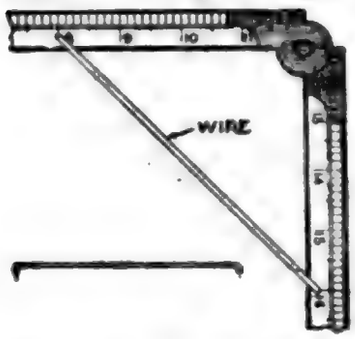
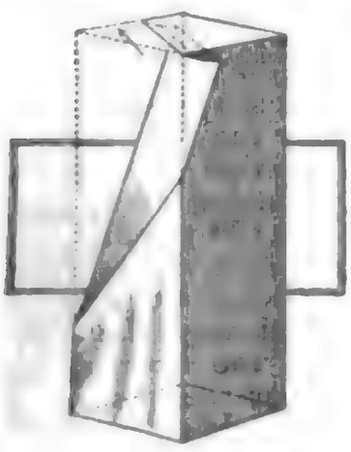
### Folding Rule Converted into Square

The workman who wishes to carry with him a tool that can be converted at short notice into a square, has only to fit into his folding rule a piece of wire, bent to a right angle at the ends. Two holes are made in the rule to take the ends of the wire, and these must, of course, be located quite accurately, in order to form a useful square. A good way of doing this is to lay the rule, opened to a right angle, within the angle of a carpenter's square; lay the wire on the rule, and strike both ends a few taps with a hammer, thus marking the points on the wood where holes should be drilled. After these holes are made, the accuracy of the right angle should again be tested by fitting it against the steel square, and any error may be corrected by carefully bending the wire. One end of the wire may be attached permanently to the rule, or the wire may be taken off and carried in the pocket beside the rule.—D. J. McKean, Alameda, California.



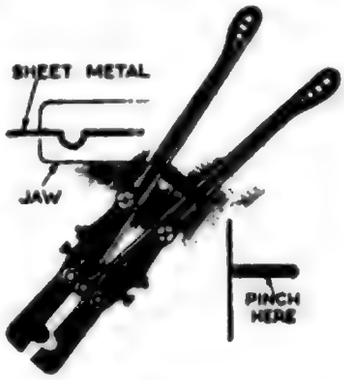

### Wood-Turning Tool for Lathe

It is occasionally necessary to turn up a piece of wood in the metal-working or engine lathe. This can be done quite satisfactorily if the lathe is put on one of its higher speeds and a special tool is used in the tool post, ground as shown in the sketch. The tool should be set so that about the middle of the slanting cutting edge is level with the center line of the spindle. It is fed in the direction indicated by the arrow. The tool is designed for ordinary soft and fairly hard woods; but when working with extremely hard varieties, such as ebony, lignum vitæ, and similar materials, a tool more like a metal-cutting tool should be used in order to insure the best results.



### Sheet Metal Joined without Rivets

For joining sheet metal together, false rivets, made by simply pinching the seam into a distorted form at certain spots, can take the place of some of the actual rivets which would otherwise be necessary. A tool for doing this false riveting is readily made from a common bolt cutter, by welding onto the jaws a small punch and drawing die. With this tool, the seam is pinched at intervals, drawing the metal out to what looks, from one side, like a round rivet head.—B. W. Butler, Truman, Minn.

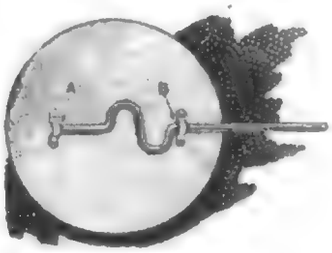



### A Wire Hoe for Garden Use

The delicate work necessary in cultivating vegetables is done better by substituting for the hoe a small, light tool which can be used with one hand. The triangular head is made of heavy wire, and a stick of any convenient length serves as a handle for the tool.

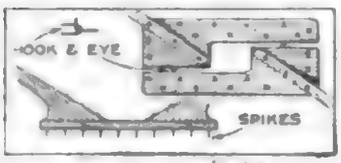
### Firm Fastening for Damper Shaft

A damper, which had worked loose on its square shaft, was mounted, instead, on a round shaft bent to an S-shape, which held it much better than the square one had done. The distance AB on the shaft must be made less than the distance between the two straps on the damper, so that the shaft can be inserted under strap B, then pushed forward under strap A, and finally fastened with a cotter pin set through a small hole previously drilled through end A.



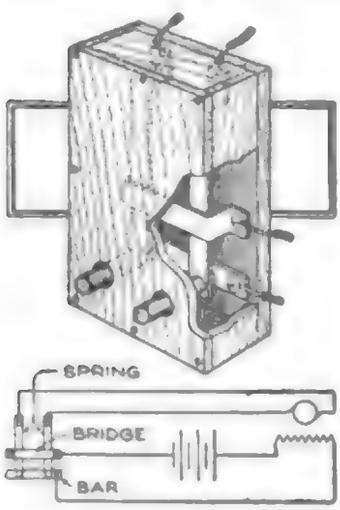
### Cultivating Ground around a Tree

Fruit trees thrive better if grass is prevented from growing around them and drawing nourishment from the soil. The owner of an orchard had so many trees that the labor of cultivating the soil around each of them took up too much of his time; and accordingly he constructed a tool which enabled him to rake the earth on all sides of the trunk with one movement of the hand. Thin boards with heavy nails driven through them were so contrived that when two of them were hooked together they formed a rectangular harrow completely inclosing the trunk. Handles fixed at opposite corners enable the entire work to be done without stooping, or two men to handle the tool, thus securing greater speed.—A. S. Thomas, Amherstburg, Ont., Can.

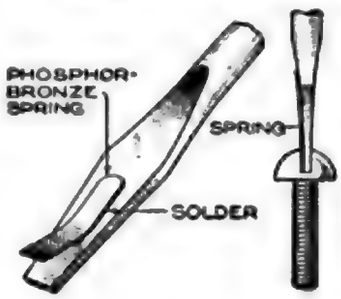


### Push-Button Reversing Switch

An interesting type of reversing switch, or key, is applicable wherever a circuit is to be closed only during a short interval, but must be closed in opposite directions. Such a case would be where a motor is used for raising and lowering a curtain, or moving any object back and forth. Normally, both springs are in contact with the bridge which passes over them, and to which one of the connections is made. Either spring, when depressed, breaks contact with the bridge and makes contact with the bar below it, to which is connected the other wire from the battery, or power mains. The two springs are connected to the motor, or other device to be operated. It will be noted that pressing the button to the left closes the circuit in one direction through the motor, and pressing the one at the right closes it in the other direction. There is no possibility of a short circuit, since, if both buttons should be pressed at the same time, the circuit remains broken.—Thos. W. Benson, Philadelphia, Pa.



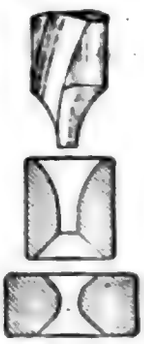

### A Screwdriver with Spring Grip




Soldering a small, flat, phosphor-bronze spring to a screwdriver blade, as shown, produces a tool which will hold the screw firmly for starting.

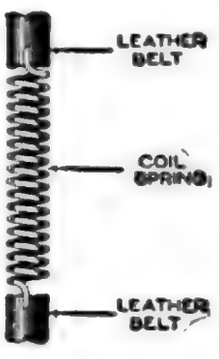
### Countersinking Special Shapes with a Twist Drill

For countersinking irregular-shaped holes in metals, it is often thought necessary to make quite expensive tools. This work can, however, be done with an ordinary twist drill. Grind both lips to the level or curve desired; then grind the cutting edge off one lip, so that it cannot cut. This dulled lip will ride around in the hole without cutting, and will steady the other lip so that it will cut smoothly and without chattering. A countersink of almost any shape can thus be made at a very small expense.



### Coupling for Sewing-Machine Belts

The weakest part of a sewing-machine belt is the joint made by the wire staple. The metal is generally so thin that it acts like a cutting edge, and eventually tears the leather. After it has been repaired once or twice in the usual way the belt becomes too taut to be of further use, but if a joint is made with a coil spring the same belt may be used indefinitely, since an elastic coupling will not subject the material at the hole to so great a strain as a rigid link. Many repairs can be made before discarding the belt, as repeated lengthen-

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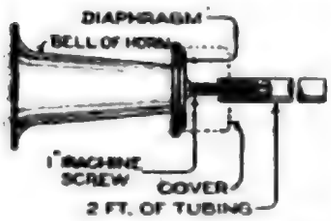
ing of the spring compensates for repeated shortening of the leather. The spring must, of course, be of the same diameter as the belt.—John P. Robinson, Santa Fe, N. Mex.

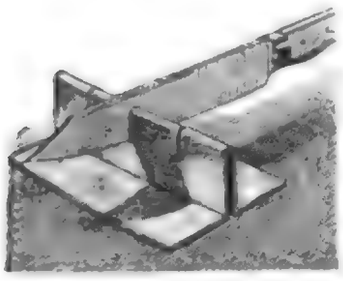
### Old Auto Horn Locates Knocks

The sketch shows a quickly contrived instrument for locating knocks in automobile engines. A discarded automobile horn, a 1-in. machine screw, and a piece of metal tubing, 2 ft. long, are all the materials required. Everything is removed from the horn except the bell, the diaphragm, and the diaphragm mounting. The 1-in. machine screw is then soldered to the center of the back of the diaphragm. One end of the tubing is threaded to fit onto this screw. By placing the horn to the ear, and the end of the tube on various parts of the motor while it is running, the knocking can be easily and quickly located.—Ernest G. Roesch, Chicago, Ill.




### A Kitchen-Knife Holder

Kitchen knives which are thrown loose in a drawer, besides being hard to find when wanted, are sure to take up too much room, and also likely to get their edges nicked by contact with each other. A very simple method of keeping them in order is to bend a piece of sheet aluminum to the shape shown in the sketch, saw a slot for each knife, and tack the aluminum piece to the bottom of the kitchen drawer. It takes scarcely any longer time to lay the knives in order in this rack than it would to throw them loose in the drawer, and their edges are thus protected from coming in contact with any iron or steel. Sufficient space should be left between the slots so that the knives can be seen and the proper one selected, when wanted. If only a part of the drawer is to be utilized for the knives, a wooden rail should be placed so as to divide off the space intended for them, and keep separate the articles kept in the other part of the drawer.



### Handle for Carrying Paint Pots

Several paint pots can be carried with one hand if they are hung in a row on a rod. The hooks which support them are movable, and are held by setscrews at any position desired. If, therefore, the pots all contain different quantities of paint, the carrier can be kept in equilibrium by moving the pots nearer to or farther from the handle. This is a simple application of the principle of the lever.—James E. Noble, Kingston, Ont., Can.

### Socket Holds Bolts from Turning

A very small, but handy, tool in the auto-repair shop is a piece of sheet steel, cut to the shape indicated in the sketch. It is used as a wrench to hold the nut, or head, at one end of a bolt, while the other end is loosened or tightened. The advantage of the small piece over an ordinary wrench is that it will fit into many places where the ordinary solid wrench would not, and where perhaps the services of another man would be required to hold a socket wrench. Carbon steel, tempered low, is the best material for such sockets.—D. F. Healey, Holyoke, Mass.

### Hole in Rim Helps Remove Tires

In warm weather an automobile tire is apt to stick to the rim of the wheel, which makes it difficult to remove. This trouble can be avoided by making holes in the rim large enough to admit the tire tool, which is thrust through the hole and dislodges the tire. Each aperture is made by drilling small holes side by side and joining them together with a file. If the apertures are made about a foot apart, the rim will not be weakened enough to cause danger.

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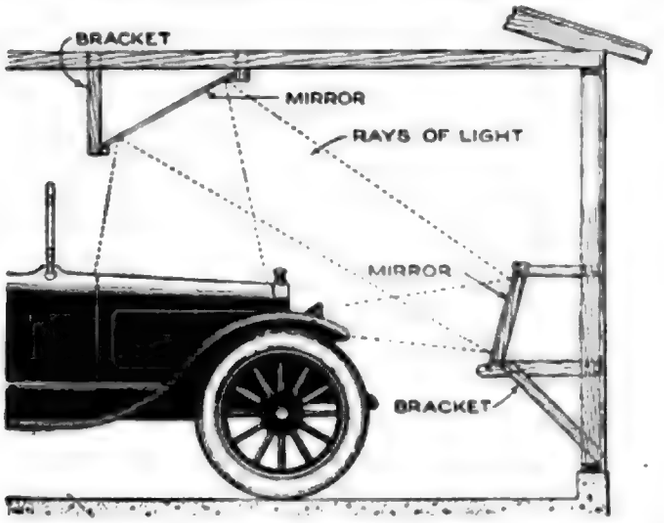
### Garage Lighted by Auto Headlights

In a garage not otherwise provided with electric lights, the headlights of the car can be made to throw light upon the




**By Means of Mirrors Properly Placed, the Headlights of the Car Throw a Powerful Light on the Engine**

engine. Two mirrors are installed permanently in the garage, in the positions indicated in the diagram. The angles at which these mirrors are fastened, and the position of the upper one, must be determined by experiment, and the car must, of course, be stopped in the same place each time when the engine is to be illuminated by this method. The stray rays of light will ordinarily illuminate the whole garage sufficiently for lighting the way when starting out or returning from a trip in the dark.—C. D. Zellar, Oak Park, Ill.

### Burlap Used on Poultry-House Nests and Roosts

By covering the fronts of poultry nests with burlap curtains, the nests are made dark, and therefore more attractive to the hens. They are also a protection against egg-eating, since the hens will not eat eggs lying in darkened nests. If they already have the habit, they can be broken of it by providing the nests with the burlap curtains. These curtains should fall to within 3 in. of the bottom of the nests, and each should have a V-shaped piece, 4 by 5 in. in size, cut out for air, and a small amount of light.

For nests used by sitting hens, the curtain should be made to cover the whole nest, a diamond-shaped piece being cut out for air and light. The curtains should be fastened with hooks, so that the hen may be released twice a day for food, water, and exercise.

Hens may be kept from roosting in the entrances of nests by tacking a narrow strip of burlap across the front. This provides a support which is too unstable for the hens to roost on. The nest is thus kept much cleaner, and the hens broken of their bad habit.

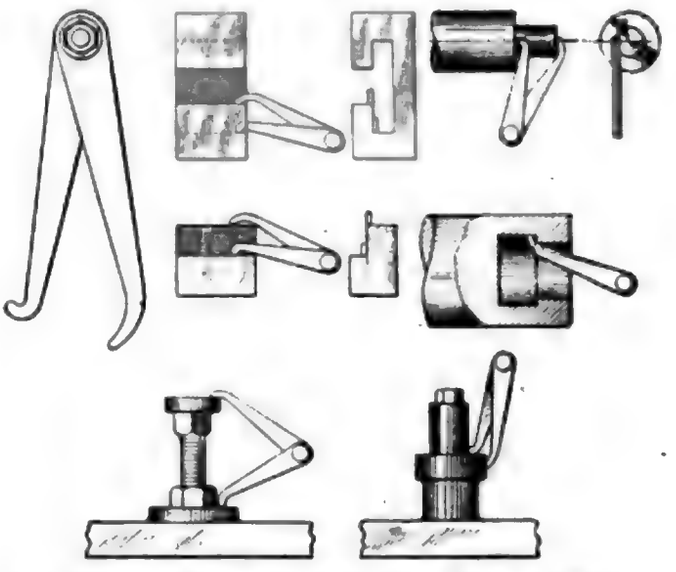
Roosting on the top of nests may be stopped by tacking burlap to the wall of the house and to the front edge of the nests, making a slanting roof upon which it is impossible to roost.—J. T. Bartlett, Ft. Collins, Col.

### Protecting a Fence from Bulls

A vicious bull can do so much damage to farm fences by continually charging them that it is worth while to use some method of reinforcement. Set a row of posts, 3 ft. apart, about 4 ft. from the fence, to break the shock of the bull's charge. The posts, which can be taken from old fences, cost very little, and are an economical alternative to the expense of building a new fence.

### A Caliper Distance Gauge

A handy tool in the shop is a pair of inside calipers, with one leg reversed as shown. One leg should have the end bent slightly upward and the other leg have the end bent slightly downward. It gives the advantage of being able to make caliper measurements when machining one surface a certain distance from another surface, either on flat or round work; it is useful for assembling a finished part a given distance from an edge,



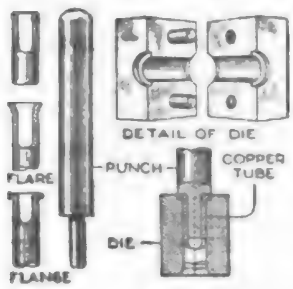
**An Inside Caliper with Both Legs Turned the Same Way Forms a Handy Gauge for Many Jobs**

undercutting surfaces or holes, measuring V-slots, and setting adjustable stops.

In all these and many other cases, some of which are shown, the mechanic has the advantage of "feel" as against scale measurements.

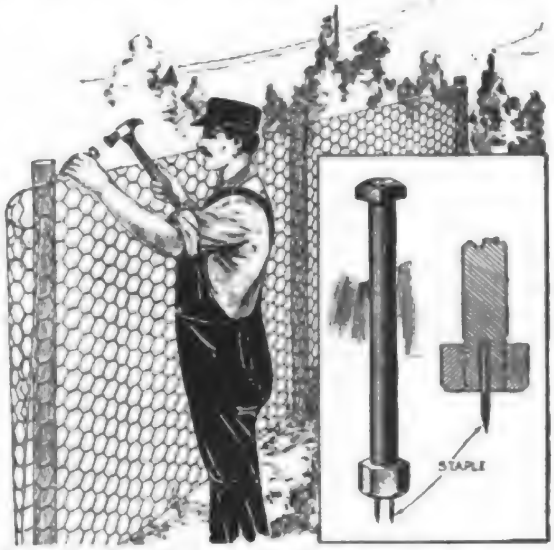
### Punch and Die for Flaring Gasoline Tubing

For the couplings used with small brass and copper tubing in automobiles, it is usually necessary to form, on the ends of the tubes to be joined, either a flare, or a right-angle flange, as illustrated. A punch and die for doing this quickly by hand is not difficult to make. Two steel blocks are fitted together so as to slide on dowel pins, and a hole is drilled half in one block and half in the other, the same size as the tubing. The faces of the two blocks are then ground off slightly so that, when the blocks are fitted together and placed in a vise, they will grip the tubing firmly. One end of this die is countersunk to a 60° angle, as shown in the sectional view. The other end is counterbored square. In using the die, first set it in the vise with the 60° side up, and clamp the tubing so that it projects from the die about 1/16 in. Insert a common 60° center punch, and one or two well-adjusted blows with a hammer will produce the flare. If the right-angle flange is required, reverse the die on the tube, and drive in the special punch shown. This punch, like the die, will fit only one diameter and thickness of the tubing, but where there is a great deal of this work to be done with one size of tubing, the use of the punch and die may save much time. If durability is wanted, the parts should be made of tool steel and hardened.




### Tool for Fastening Poultry Netting with Staples

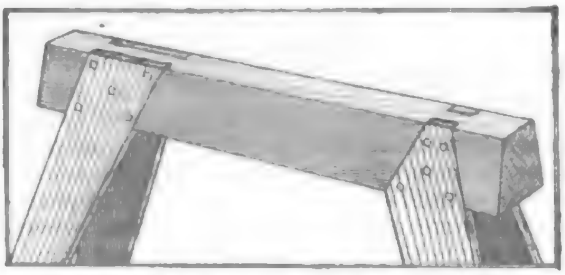
Anyone who has fenced a chicken yard has felt the need of an extra pair of hands. The staples must be held in position while they are being hammered into the posts, and at the same time the netting must be held taut. With a long bolt and a nut, a tool can be made which enables one hand to hold the staple and stretch the netting, while the other hand is free to use the hammer. A 7/16-in. bolt, about 7 in. long, will suit the purpose. Run the nut on as far as it will go, saw the threaded end off with a hacksaw close to the nut, and remove the nut. Cut a slot in the threaded end of the bolt, making it sufficiently deep and wide to hold a staple, after which replace the nut. The tool can now be used to hold the points of the staple against the post, and also to keep the netting taut, while blows from a hammer upon the head of the bolt drive the staple home.—M. L. Lowrey, Livermore, Calif.




A Slotted Bolt for Holding Staples Saves the Hands of a Fence Builder from Injury

### Mounting Legs on Shop Trestles

Many shop trestles are built with legs attached as shown at the left. When a heavy weight comes on the trestle, the whole strain comes on the nails, and they are likely to loosen. If the legs are set in as shown at the right, the trestle will sustain a considerably greater weight without danger of being crushed.—E. K. Wehry, Cedar Rapids, Ia.



The Method of Attaching Legs as at the Right Results in Greater Strength of the Trestle, and Is Scarcely More Difficult to Carry Out

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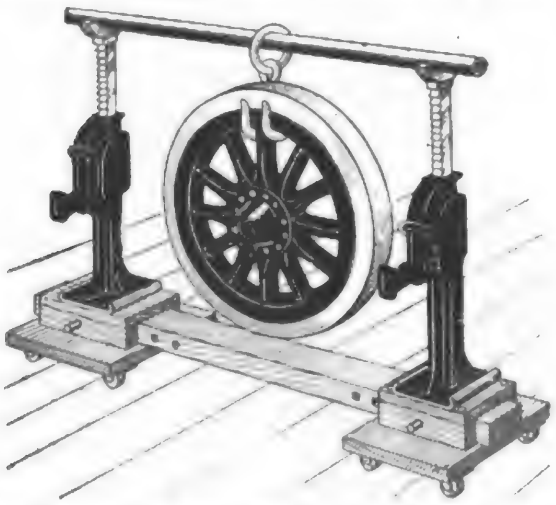
### Jacks for Replacing Truck Wheels

Time and labor are saved in a motor-truck repair shop by mounting two jacks on a traveling platform when heavy truck



**A Movable Platform and a Pair of Jacks Make Truck Wheels Easy to Handle**

wheels are being replaced. Without effort, one man does a job which, under usual conditions, calls for three—two to lift the wheel and one to steady it. The platform is made by mounting two wooden bases on casters and connecting them by a yoke, or wooden link, which makes a sliding fit in the bases supporting the jacks. This makes it possible to change the distance betwen the bases and to use them for a variety of operations. Greater stability is obtained by making the bases wide enough to give abundant space between the casters. The jacks can be removed by sliding them out, and used for other purposes.—John G. Pope, Worcester, Mass.

### Growing Giant Fruits

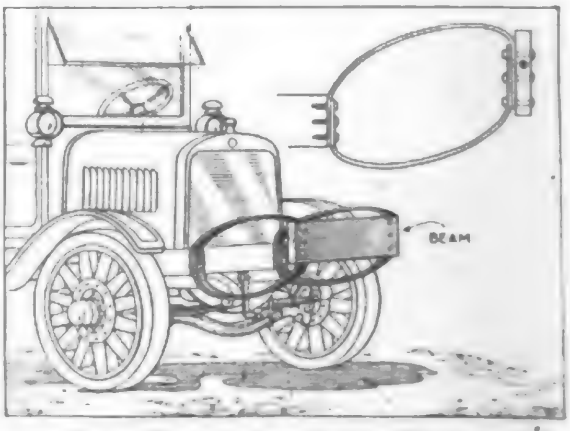
A remarkable way of securing giant apples and pears is to treat them with a solution of 24 grains of iron sulphate, to 1 pt. of water. It has been known for some time that the washing of leaves with such a solution enables them to absorb sap more freely. Recently the plan has been adopted in the case of the fruits, with astonishing results. Three applications were made in all. The first washing was when the fruits were about three-quarters grown; the second a month later, and the third when the specimens were almost fully developed. The solution was sprayed or washed over the fruits, either process appearing to be entirely satisfactory. The application was made in the evening when there was no likelihood of the sun striking the fruit for some hours. The fruits showed wonderful speeding up of growth after the first washing. In some cases, it was estimated that the rate of development was twice as fast as that of the untreated specimens. In the end, the fruit was larger and better in all ways. It was easy to discern from a considerable distance the difference between the treated and the untreated fruits.—S. Leonard, Bastin, Bournemouth, Eng.

### File Cleaner Made from Rod

For cleaning lead, or solder, from file teeth, a piece of square copper, or soft-iron, rod is a handy tool. Cut the ends off square, and push the edge over the teeth in the same way as commonly done with a pine stick. Some pressure is necessary, to imbed the teeth in the edge of the rod. The eight edges of the two ends can be used for teeth of various degrees of coarseness.

### Truck Bumpers from Auto Springs

Discarded 36-in. spring leaves were used in the construction of homemade bumpers to protect a fleet of coal trucks. Two pairs of leaves, bolted, as shown, to the front cross member of each truck, supported a wooden beam, 5 ft. long, 12 in. wide, and 2½ in. thick, which received the impact of any object that collided with the truck. The leaves were heated and bent into shape, after which the ends




**At a Cost of Three or Four Dollars Old Automobile Springs are Made into Bumpers**

were drilled, with the holes at the ends of each pair corresponding. They were then retempered and installed on the truck in the position indicated.

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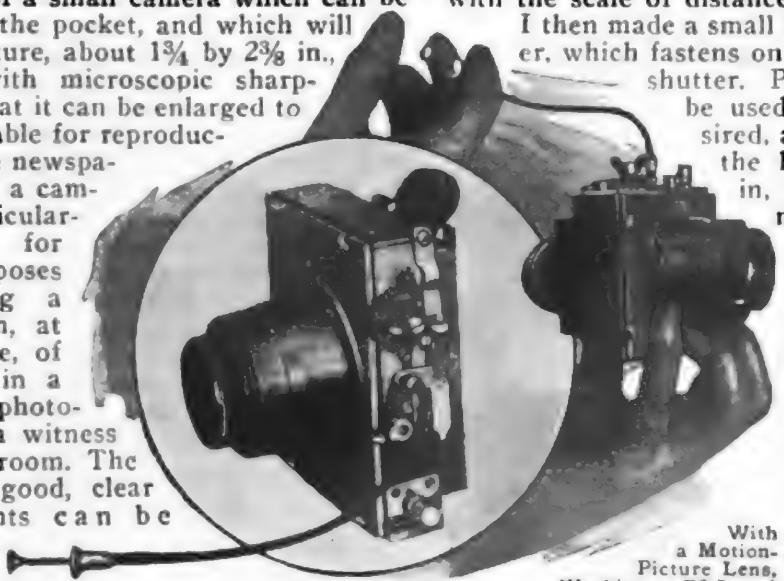
# A High-Grade Miniature Camera

By G. R. WATSON

AS a newspaper photographer, working under all conditions, I have often felt the need of a small camera which can be carried in the pocket, and which will take a picture, about 1¾ by 2⅜ in., focused with microscopic sharpness, so that it can be enlarged to a size suitable for reproduction in the newspaper. Such a camera is particularly handy for such purposes as making a photograph, at close range, of a person in a crowd, or photographing a witness in a court room. The fact that good, clear enlargements can be made from very small negatives is apparent from the consideration of motion-picture films, where a negative, ¾ in. by 1 in., is enlarged on the screen to perhaps 12 by 14 ft., with little sacrifice of definition, and with great depth of field. Remembering this, I decided to make a small camera which would take high-quality negatives, so as to permit reasonable enlargement without the loss of clearness.



With a Motion-Picture Lens, Working at F3.5, and a Roller-Blind Shutter, Giving Speeds up to One-Hundredth Second, or Faster, This Little Camera Makes Pictures of Such Accuracy That They can be Greatly Enlarged without Loss of Sharpness

The first requirement for such a camera is a fast lens of good quality, since the exposures must be very short, in order to preserve accurate definition. The focal length of the lens must, of course, be short, so that the entire camera will be of pocket size. With it a very fast shutter must be used. These requirements I met by using a motion-picture lens of 3-in. focal length, capable of a speed of F 3.5, together with an old focal-plane shutter. I made a collar, or jacket, of brass, about 2¼ in. long, with a flange on both ends; the lens to screw into one end, and the other to be screwed onto the shutter. The lens was provided with a focusing mount, with the scale of distances marked on it.

I then made a small film-pack adapter, which fastens on the back of the shutter. Plate holders can be used instead, if desired, and grooves, for the holders to slide in, would then be made on the back of the shutter, the back being first covered with felt or plush, to make it light-tight. Preferring, however, to use film packs, I made a pack holder of brass — a little tray-like device that screws on behind the shutter, with one end left open in order to admit the film pack, and furnished with springs on the inside to hold the film pack tight against the plush-covered back of the camera or shutter. Two other springs on the side of the film-pack holder slip over the film pack when it is inserted, and hold it in position. The lens is supplied with a cap which must be put over it between exposures, to keep out the light while rewinding the shutter.

It is very important that the lens be properly adjusted so that the distances on its focusing scale will be correct, since an error of a small fraction of an inch in a lens of such short focal length will make a big difference in the sharpness of the image. To make this adjustment, put in a ground glass in the exact position which will be occupied by the film or plate, and adjust the lens to its proper position, after which it must be fastened securely. If an error has been made in this adjustment,



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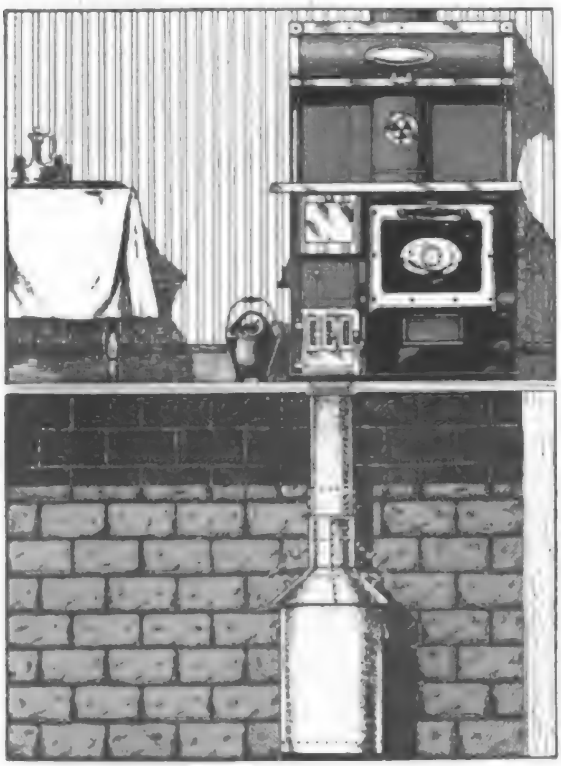
it will be apparent from the first few pictures taken, and can then be corrected.

The advantage of the short-focus lens, besides the possibility of carrying the camera in the pocket, lies in the greater depth of field which it gives. In other words, the shorter the focus, the nearer universal is the lens. It does not, however, do to have the focal length too short, as the distortion in perspective may then be too great. In my experience, the 3-in. lens is ideal for this type of camera. With this outfit, a good-sized head and shoulders can be taken at a distance of 3 ft. Flash-light exposures can be made with a very small charge of powder, owing to the large aperture of the lens. I have used the camera for professional work on a large-city daily newspaper, and have made many pictures with it which would have been impossible to take with a large camera.

### Ash Chute Saves Steps in the Kitchen

To empty ashes from the cookstove, the housewife is obliged to make many



A Pipe Leading from the Cookstove to the Ash Can Lightens a Housewife's Labor

trips from the hot kitchen to the cold cellar, and in her overheated condition she runs the risk of taking a chill, besides losing time and energy in needless journeys. To prevent this, a metal chute can be made leading from the kitchen floor to the ash can in the cellar. Cut a hole, 7 in. square, in the floor in front of the stove, and nail strips of wood to the lower side of the flooring to support the cover which hides the hole when not in use. Cut a piece of 10-in. heater pipe, long enough to reach from the cellar ceiling to a distance of 2 ft. from the top of the ash can. Make four slits, 1 in. deep, in the upper end of it, and bend the metal over so as to make four flanges for fastening the pipe to the cellar ceiling. Make a galvanized-iron lid for the ash can, flat or conical in shape, preferably the latter, and connect it with the chute by a piece of piping, 10½ in. in diameter, so that the chute may be a sliding fit inside it. This connecting pipe will be made solid with the lid of the ash can and will enter it through a hole in the top. This makes it possible to raise the lid whenever the can needs emptying, and to hold it up as long as necessary by thrusting a nail through two corresponding holes punched in the chute and connecting pipe.—Joe V. Romig, Allentown, Pa.

### Breeze from Basement Cools Home or Office

A large bank office in an eastern city was kept cool and airy all summer without the annoyance of noisy fans. The means used was a 2-ft. motor-driven blower, placed in the basement and having suitable air ducts leading to various parts of the banking rooms. The blower was driven by a 5-hp. electric motor, and the air conducted to the floor above by means of 6-in. tin ducts. Smaller ducts opened into ordinary speaking-tube mouthpieces, located at convenient places at each cage and near each desk. Air valves were inserted near the mouthpieces, so that the occupant of each cage could regulate the air supply to suit his personal convenience. The result of this system was sufficient cooling with no noise and no annoying drafts.

A similar arrangement without a blower is used by a private family in their home. The grade entrance to the laundry is left open, which admits a breeze into the basement. The cool cellar air immediately travels up the air pipes, and as the first-floor doors and windows are kept closed and the upper windows are left open, all the warm air in the house rises to the top,

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where it finds an exit, and the cool air continues upward from cellar to roof in a steady stream. By using a fan in the basement, the system could, of course, be made more effective.

### Making Dry Barrels Water-Tight

Wooden casks that have dried and begun to leak are repaired by being soaked with water until the wood swells and stops the leaks. The usual method is very slow and laborious. Water is poured into the cask and renewed as fast as it runs out, until the leaks close, but the cask has to be refilled so often that a less tedious method is a real necessity. Stuff the cask with straw and place a large stone on the top. Saturate with water, and the straw will retain enough moisture to swell the wood after the water has escaped.

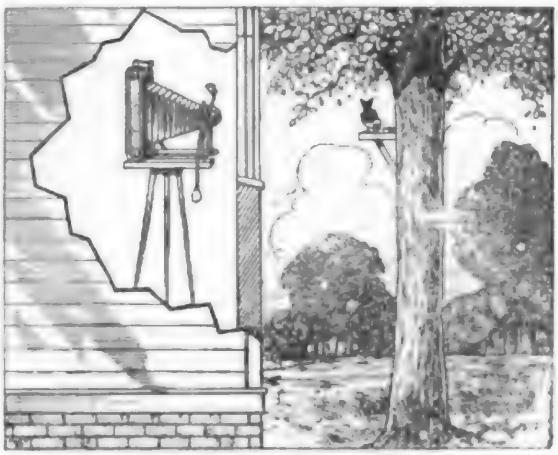
### Making Gates of Old Metal Beds

Gates for garden or yard have been made cheaply from old iron beds. For the single gate, on the left of the illustration, only the bed spring was used, which in this case was of steel fabric. It was braced at the corners, after which a few ornamental touches were added, according to the maker's taste, by bending lengths of 3/16-in. strap iron into scrollwork.

For the double gate, a more decorative entrance was made by combining the head and foot, which in this case matched exactly. When the two parts differ in design or size, it will be necessary to remove some of the original material until exact similarity is obtained, and then to add ornamental iron of the same design to both parts.

### Perch Aids in Photographing Birds

Good photographs of small wild birds are hard to make because of the difficulty



Wild Birds Attracted by a Baited Perch Pose Unconsciously for Their Portraits

of getting near them with a camera. A perch fastened close to a window and baited with bread crumbs gives the photographer many a chance to make close-range exposures.—Violet Johnson, Rockford, Ill.

### Repairing Snap Button of Glove

A glove button of the usual snap pattern is so liable to be flattened and made useless that it is handy to know how to repair it without using tools. Lay the flattened button over the socket and drive it in with an ordinary watch-chain bar, or other piece of wire, using a pocketknife as a hammer. The button again assumes the same contour as the socket, and if it becomes a little too sharp it can be slightly flattened by light taps with the knife.

With Metal Scrollwork and a Coat of Paint, Discarded Beds are Transformed into Garden Gates. In the Illustration at the Right, the Head and Foot are Used; in the Other, the Steel Bed Spring

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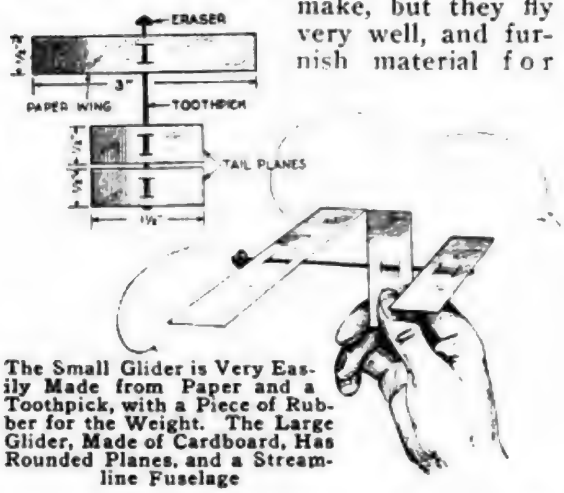
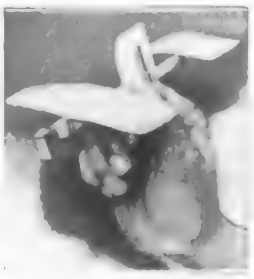
## Airplane Gliders Made of Paper

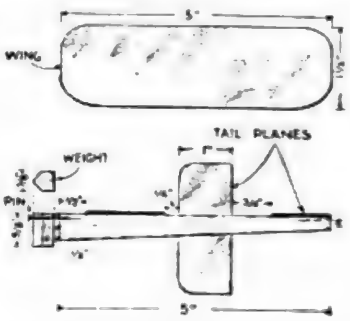
The two model glider airplanes shown in the drawings are simple and easy to make, but they fly very well, and furnish material for interesting experiments. Rather stiff writing paper can be used for the planes of the smaller glider. The three planes, when cut to the dimensions given in the sketch, are secured to a toothpick with glue. For a weight, a small piece of a rubber eraser is stuck onto the front end of the toothpick, without glue. Try the glider, holding it by the lower part of the middle plane, turned to a vertical position, starting it slightly upward, without using much force. It should glide for from 6 to 15 ft. If it drops quickly, it was not started properly, or the rubber is too heavy. If it turns upward, then falls, it was started at too great an angle, or the rubber is too light.



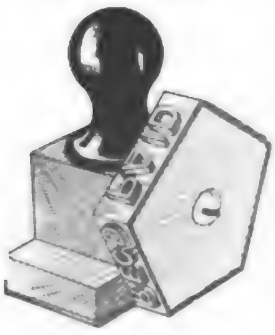

The Small Glider is Very Easily Made from Paper and a Toothpick, with a Piece of Rubber for the Weight. The Large Glider, Made of Cardboard, Has Rounded Planes, and a Streamline Fuselage



The larger glider is stronger, and is proportioned differently. It will do more "stunts" than the small one, and will fly farther, if properly made. Light cardboard, such as used for index cards or correspondence folders, is used for the planes, and photograph-mounting board, or other heavy cardboard, is used for the body or "fuselage." The planes are fastened to the fuselage with gummed labels or stickers. It will be necessary to split the fuselage for a short distance so that the central plane may be inserted. It is secured to the fuselage with stickers on both sides. The rubber weight is fastened to the front end of the fuselage with a pin. A sticker, placed around the end of the fuselage, will prevent the pin from splitting the cardboard. This glider is flown by holding it under the front plane, and starting it forward, and slightly upward. It need not be thrown with much force, but should be started with a gentle gliding motion. By bending the planes, the glider may be made to do many "stunts," such as flying upside down, starting sidewise, then righting itself.




### An Adjustable Multiple Rubber Stamp



A handy rubber stamp can be made by mounting the original stamp face upon an extra block, to which is pivoted a block having five type faces. The stamp can then be turned to print any one of them.

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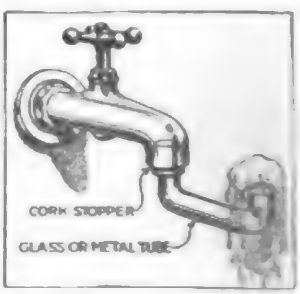
An old hacksaw blade with the teeth ground off makes a good scraper. Bevel the edges, and finish on an oilstone.

### A Temporary Drinking Fountain

Any domestic faucet can be converted into a drinking fountain by using a short piece of glass or metal tubing. The ends of the tube should be turned at a right angle for about 1 in., as shown, both ends turning in the same direction. Run one end through a cork large enough to stop the mouth of the faucet, thrust it in, and the fountain is ready.—C. S. Cierpik, Urbana, Ill.

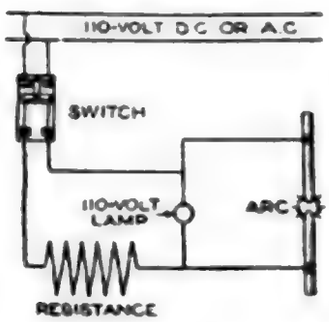


### Sign Holders Made from Film Spools

In trimming a show window it was necessary to arrange a number of price tickets without attaching them to the articles to which they referred. No wire supports were available, but stands were improvised from discarded film spools. The flange was sawed off one end of each spool, and a small slot was made across the shank at that end. The spool was then set vertical, with the remaining flange at the bottom, and the ticket inserted into the slot.

### Lamp Shows Position of Arc-Light Carbons

An incandescent lamp of low candlepower served as an indicator to show a moving-picture operator whether his carbons were the right distance apart. A 10-watt lamp, of the same voltage as the line, was connected across the terminals so that the lighting current passed through the resistance coils which were in series with the arc lamp. When the carbons were so far apart that there was no arc, the current was all diverted through the incandescent lamp, which then burned brightly. When the arc was formed, the lamp burned dimly, showing the operator that the carbons were the right distance apart; but when the carbons came into contact they formed a low-resistance path through which nearly all the current passed, and the lamp went out entirely.—John J. Carl, Greencastle, Pa.




### Staining Wood with Cloth Dyes

The ordinary fadeless dyes cost much less than wood stain, and look just as well. Dissolve a 10 or 15-cent package in a pint of hot water and lay it on with a brush, applying a second coat if the first is not deep enough. A pint of water to a package of dye makes a good mixture, but the proportion can be graded according to the tone, or shade, desired. To make the color weatherproof, a coat of shellac may be added after the mixture has dried.

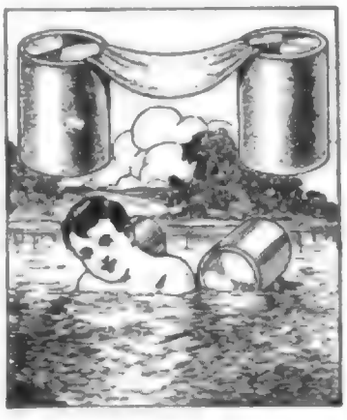
### Trailer for Velocipede

Even among toys the vehicle which travels fastest is the one which holds preference, and a child's cart will be more appreciated by its owner if attached to a toy velocipede. Disconnect the rear wheels and axle of the velocipede from its frame and bolt the latter to the front axle of the cart, as shown. —Chas. A. Goddard, Los Angeles, Calif.

**By Attaching a Velocipede to the Front Axle of a Child's Cart, a Trailer is Made Which Accommodates Several Passengers**

### Water Wings Made from Tin Cans

The boy who has access to some quiet stream where the water is 3 or 3½ ft. deep, but has no one to teach him to swim, may be able to pick up two empty tin cans of the friction type, having a cover which is pressed into a large hole in the end of the can. To these he may attach a stout but thin rag, about 18 or 24 in. long, by forcing on the covers of the cans with the ends of the rag caught under them. Or if two old varnish cans with screw top are handy, the rag may be tied to the handles of the cans, and the covers screwed on tight. The device is used like ordinary water wings, the cloth being placed under the breast or back. The cans support the body until the swimmer becomes familiar with the necessary movements. He should not venture beyond the depth in which he can safely stand up, until he has learned to swim without the wings.—Harold E. Benson, Boulder, Col.



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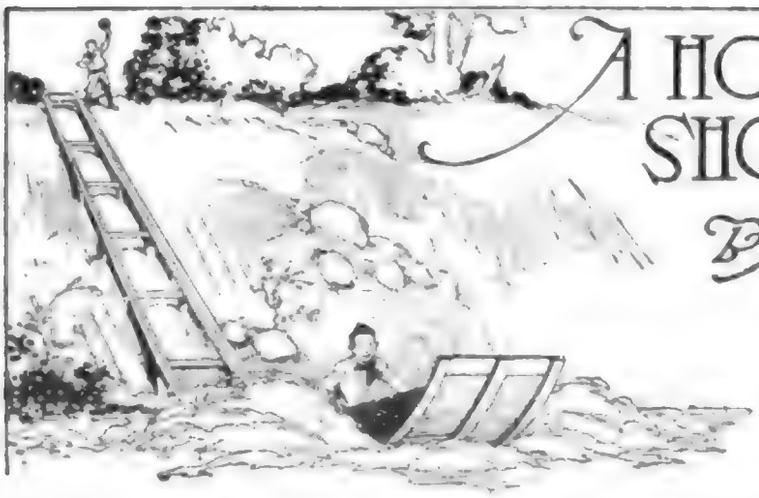

# A HOMEMADE SHOOT-THE-CHUTES

By L. P. Robbins

FOR boys who live near still water a shoot-the-chutes will furnish more thrills in one swoop down the track and onto the water than the ordinary boat furnishes all summer. The building of the structure is not beyond the average boy, and he should be able to earn whatever he spends on it by charging his friends a small sum for the privilege of sharing his thrills.

There should be a fairly steep hill for the track; it need not be over 75 ft. long. The water must be quiet and the current very slow; a spot should be selected where the water is not over 3 or 4 ft. deep.

The boat, shown in Fig. 1, is built as light as possible, so that it is easy for the boy to pull it back up the track after each trip. Two planed boards, ¾ by 12 in. by 8 ft., are needed for the sides of the boat. These are left full width at a point 3 ft. from what is to be the front, or bow, of the boat, and taper from this point to the back, or stern, of the boat, where they are 4 in. wide. In front, the sides curve gradually to the bow, where they are pointed. A pattern for this curved outline may be made by bending a light piece of wood between the two points; a line is then drawn along the edge of the stick to saw by. Both sides of the boat must be cut out exactly the same, and must have smooth, level edges.

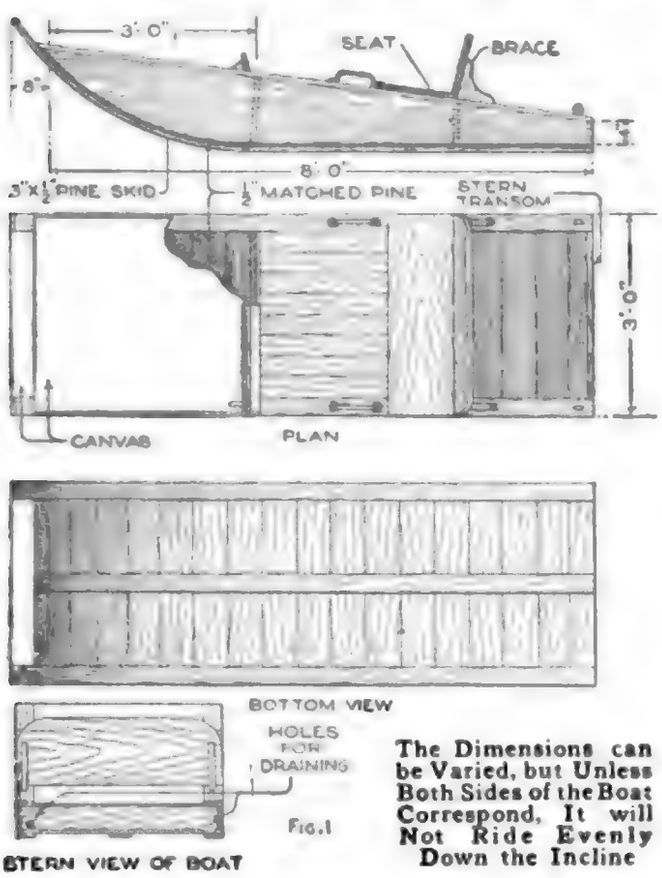


Fig. 1

The Dimensions can be Varied, but Unless Both Sides of the Boat Correspond, It will Not Ride Evenly Down the Incline

Place the boards on the floor with the straight edges down, brace them solidly 3 ft. apart, and fit in the stern piece, which is ¾ in. thick. Then make two partitions or bulkheads, to be placed as shown; the bottoms of these boards must have notches cut in them so that any water that gets into the boat will flow out at the back. It can be removed through two 1-in. holes bored in the stern piece, and fitted with plugs.

The bottom of the boat is of ½-in. matched pine, laid crossways. Thick paint should be flowed into the groove and onto the edge of the hull before the bottom boards are nailed on, as the joints must be water-tight. When this is in place, nail two skids of hard pine along each edge of the bottom, and nail a keel of the same material along the middle of the bottom. The two skids should be cut even with the stern of the boat, but should project somewhat at the bow. All nails must be carefully clinched on the inside of the boat.

When this is done, turn the hull over and fasten it with braces, so that it will not rock while the top or deck is being put on. Three strips, similar to the skids, are nailed to the edges of the hull and to the middle, running the entire length of the boat. The space between the two bulkheads is covered with matched pine, such as is used in the bottom of the boat. The rest of the deck is covered with 8-oz. canvas, stretched tightly and tacked along the top of the sides. The edges should be covered with a thin strip of molding, to keep the canvas from fraying. All should then be painted with at least four coats of good-quality paint.

The seat is a board nailed across the deck and fitted with a back rest, held



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solidly in place by two brackets of wood, or iron. A pair of handles, such as are used on light doors, are screwed to the deck in front of the seat, for the rider to hold on to while making the descent. A ring bolt is placed in each corner of the stern, for the rope used in dragging the boat back up the incline. It will also be necessary to tack a piece of canvas to the projecting ends of the skids, to protect the rider from the spray.

The track is simpler to make, and is seen in Fig. 2. Two lines of posts, placed 3 ft. apart, are run from the water's edge to the top of the hill. The rails of the track are pine boards nailed, flat side up, on top of these posts. Care must be taken to have them spaced properly, and exactly in line over all the distance. The sideboards are guides which prevent the boat from leaving the track, and should be screwed firmly to the rails. The track should be curved gradually so that it is practically level where the boat strikes the water. A landing platform of some sort should be erected at the upper end, from which to make a start. Give the rails a thick coat of heavy grease, such as used for automobile transmissions or wagon axles. This should be renewed from time to time.

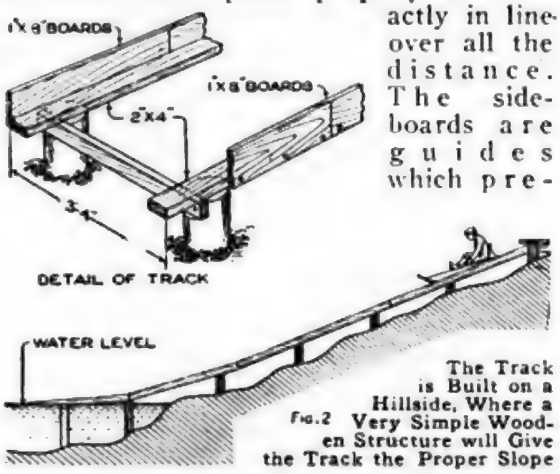

Fig. 2 The Track is Built on a Hillside, Where a Very Simple Wooden Structure will Give the Track the Proper Slope

When all is ready, place the boat on the rails, climb aboard, hold on tightly to the handles in front of the seat, and give the boat a little push to start it. It will gather speed at every foot, and will hit the water with a rush, barely skimming along the surface. It will be necessary to provide the boat with a canoe paddle, so that it may be propelled back to the shore.

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¶A dished oilstone can be flattened on a sheet of coarse-grained carborundum paper tacked to flat wood. Finish on paper of finer grain.

## Simple Car Heater Made from Sink Drain

Warm air rising from the motor and exhaust of an automobile provides sufficient heat to keep the driver comfortable even on very cold days. If a hole is cut in the front floor board over the exhaust and covered with a sink drain, warmth which rises through the perforations will be retained in the lap robe. Any sink drain will serve to cover the hole,

but the heat can be regulated with great precision by using the type that is equipped with two disks pivoted at the center. The perforations on both disks correspond, so that by turning the upper one with a small knob the holes may be made to coincide, leaving the drain open. In any other position, the drain is partly or completely closed, and the heat can be regulated according to the weather.—Kenneth E. Lohman, Los Angeles, Calif.

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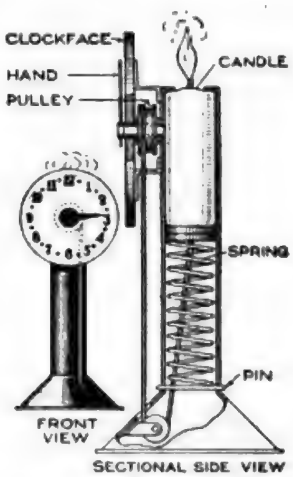
## Clock Operated by Candle

The practice of using candles to measure time is one of considerable antiquity, and even in these days, whenever extreme accuracy is not needed, a fairly serviceable clock can be made by connecting a dial with a candle, provided it can be made to burn evenly. The candlestick here shown is open at the bottom to admit a candle with a spring below it. The latter is held in position by a pin, and the dial pulley is attached to a cup or washer under the candle by a cord which passes around a pulley at the candlestick base. A little experimenting is necessary before a candle is found which will burn at the rate desired.—S. Leonard Bastin, Bournemouth, Eng.

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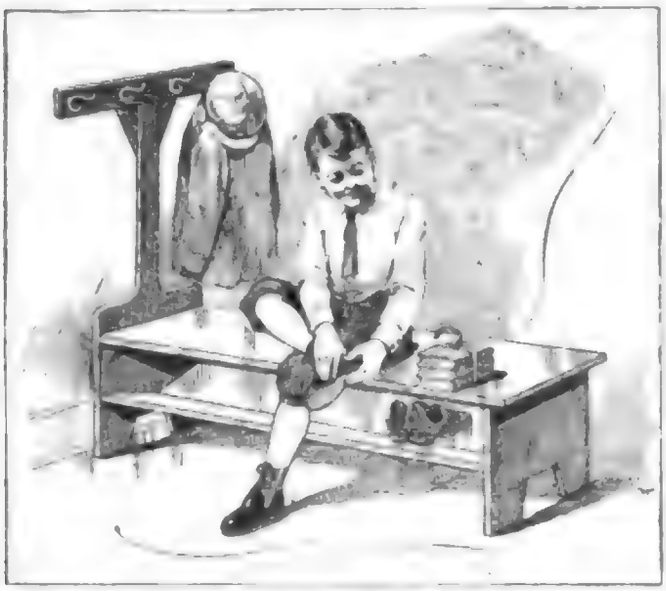
### Hall Rack for Children's Clothes

If children have no definite place to put their muddy shoes and outer garments, they cannot be blamed when they



A Rack for Children's Coats, Hats, and Overshoes Protects Both Carpets and Clothes

leave them in wrong places. A combination bench and rack, which can be made from a few 1-in. boards, will be a constant reminder if placed near the front door. Unless the family is large, the bench need not be more than 1 by 3 ft. If the top of the seat is 14 in. from the floor, there is room beneath it for a tray to hold shoes and rubbers.—C. L. Meller, Fargo, N. D.

### Cattail Stems for Cheap Arrows

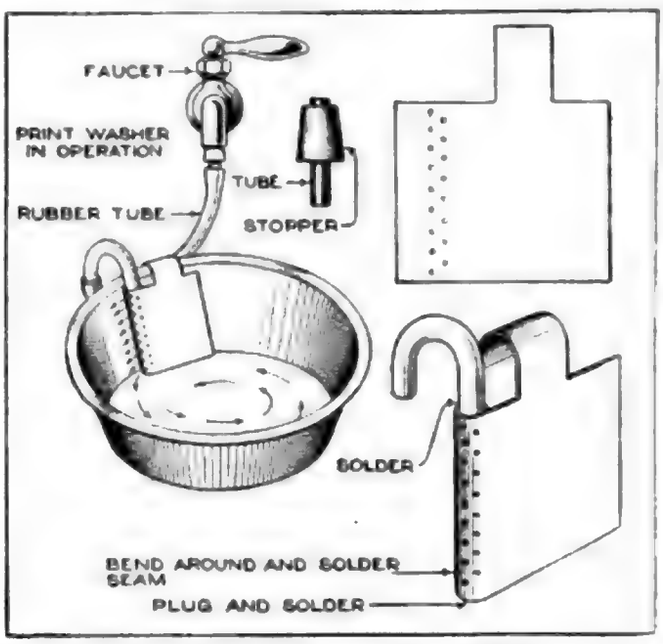
A boy who made a pastime of archery lost so many arrows that he was obliged to find a quick and cheap way of making new ones. He found an endless supply in a neighboring marsh where cattails were abundant. He cut a number of straight ones into even lengths and drove a shingle nail into the thick end of each. He then notched the smaller ends, and found on trial that they had nearly the same range as the best arrows procurable and could be used with great accuracy.

### A Handy Fire Kindler

In order to light fires quickly a contrivance was made from asbestos and wire. A 2-ft. length of wire was cut, and 8 in. from one end, a loop was made, about 2 in. in diameter. Across the loop was laid a piece of asbestos, 2 by 3 in. in size, the remainder of the wire being wound back and forth over the loop to hold the asbestos in position. The asbestos was then dipped in kerosene, lighted, and placed under the fuel, where it started a good fire in less than three minutes, after which it was withdrawn by the 8-in. portion of the wire, which formed the handle of the kindler, and which had been left projecting from the grate.—Philip A. Wall, Bedford, Mass.

### Whirling-Water Print Washer

Without a specially constructed tank with an aperture at each end, the amateur photographer finds difficulty in washing his prints after taking them from the fixing bath. It is not sufficient to change the water by letting the faucet run continually, as there is not enough movement in the tank to insure complete cleansing of the prints. For best results, the water must be kept traveling rapidly through the tank or around it, and the latter condition is obtained with any circular metal dish if it is equipped with the appliance shown in the illustration. It is made by cutting a piece of sheet copper or zinc, and punching two or three rows of holes at one end with a nail. This end is bent around and soldered in such a way th: a blind alley is formed from which incoming water can only escape through the punched holes. A narrow piece of lead pipe connects it by a rubber tube with the faucet, and as the pressure of the water is concentrated against the perforated surface, it issues from the holes with




A Cheaply Made Appliance Keeps Photographic Prints from Becoming Clouded

great force, and causes the conten' of the dish to whirl at high speed. A dish of earthenware or enameled ware should

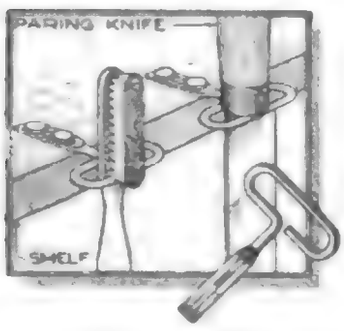
be used, so that the chemical action of the metal may not harm the prints.—J. G. Zimmerman, Milwaukee, Wis.

### Muffling the Typewriter

A typewriter placed on a sofa pillow filled with balsam and spruce boughs will have its sound effectively muffled. The packing of an ordinary sofa pillow is of little use, as it becomes compressed by the weight of the machine; but with spruce or balsam boughs the noise is absorbed, and not transmitted by the desk and adjacent woodwork.—F. E. Brimmer, Syracuse, N. Y.

### Tin-Can Keys Used as Racks

When a meat can has been opened the usefulness of the metal key is not at an end. It can be fastened with tacks, or nails, to a shelf, in a bathroom or over a kitchen sink, and used as a bracket to hold a variety of small domestic articles. It can also be nailed to a window sill, or projecting ledge over a shop bench, and made to hold small tools. The slot in the shank is wide enough to admit small nails, and though there is sufficient space in the head for a chisel, wrench, or screwdriver of ordinary size, it is possible to make room for larger articles by bending the wire into a slightly different shape.—Chas. H. Willey, Concord, N. H.



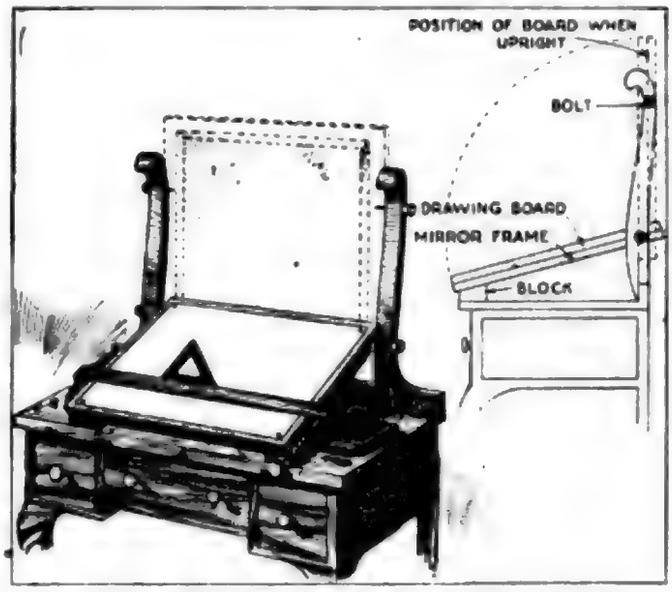

### Pail with Valve Bottom for Bailing Post Holes

Considerable difficulty is encountered in keeping water out of post holes when they are being dug in swampy ground. An ordinary hand pump cannot be used, as the quantity of water necessary for priming is as great as the quantity in the hole.

A good method is to drill three holes in the bottom of a heavy galvanized-iron pail, and to solder over them three flat hand-pump valves. Drop the pail into the hole, and its weight will open the valves, allowing the water to run in. As soon as the pail is withdrawn, the weight of the water closes the valves, so that it is easily pulled up and emptied out.

### Dresser Made into Drawing Table

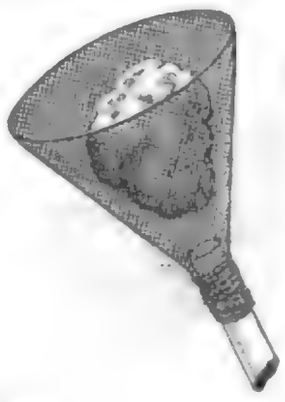
By fastening a drawing board to the back of a dresser mirror a convertible drawing table can be made. The trunnion pins are moved from the center of the frame to about 3 in. from the bottom. Wooden blocks, under the edge of the board, on the table top hold it to the proper height and angle, and when the drawing board is not in use, the mirror is held vertical by bolts at the top of the frame, turning the table back into a dresser.—Edward C. Lagergren, Chicago, Illinois.




**A Drawing Board Fastened to the Back of a Mirror Provides a Combination Drafting Table and Dresser**

### Fire Basket Kills Caterpillars

Caterpillars can be burned from trees very easily by using a pole with some wire screening on the end of it, formed into a cone-shape, and containing a piece of cloth soaked in kerosene.



### Hole in Pie Tin Prevents Bubbling of Crust

When steam forms between a pie tin and the bottom of a one-crust pie, it forces the paste upward and gives the pie an irregular appearance. Bore one or two small holes in the center of the tin, and any steam that forms will escape.

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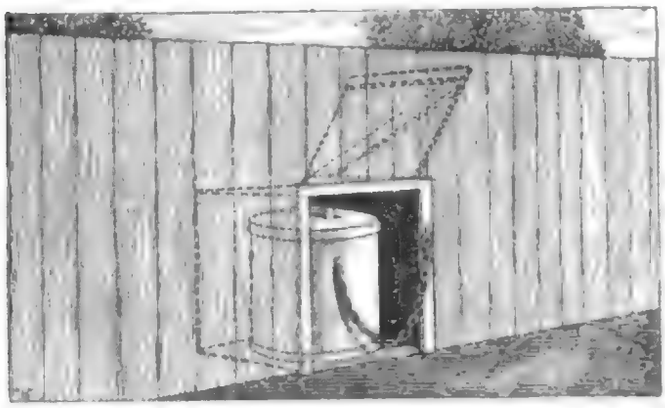
### Garbage Can Chained to Box in Fence

A family was inconvenienced by continual theft of garbage cans, and remedied the trouble by attaching the can to



A Chained Garbage Can in a Wooden Inclosure is Protected from Thieves and Practical Jokers

the alley fence with a chain, which was just long enough to enable the garbage man to empty the can. A hole was cut in the fence a little higher and wider than the can, and a box was built around it on the inside of the fence, with a hinged lid which could be lifted whenever it was necessary to dump refuse into the can. The box was open toward the alley so that the garbage collector could reach it, and was therefore not entirely protected from thieves and jokers, but the can was not nearly so conspicuous as formerly, and as a result it escaped theft and damage. In addition, it was out of the path of passing vehicles, and could not be crushed or knocked out of position by a wagon wheel. To screen it perfectly, a second lid could have been attached by hinges to the alley fence, the chain staple being set on the inside; but this was not found necessary.—Chas. A. Elliott, Philadelphia, Pa.

### Smooth Backgrounds for Photographs

Amateur photographers often use shawls, blankets, or other dark-colored cloths, as backgrounds in their home portraiture. Since such portraits are usually time exposures, the texture and pattern of the cloth is easily seen in the resulting picture. This trouble is avoided by shaking the cloth slightly during the exposure, thus doing away with all detail in the background. Since it often happens that there is no third person present to shake the cloth, some way should be provided to enable the person taking the picture to agitate the background while making the exposure. A simple arrangement is to tie a stout cord to the pole from which the background is hung. Two or three sharp jerks on this cord during the exposure will prevent any details of the fabric from being visible on the print.—Hugo J. Engel, New Braunfels, Tex.

### Coat Hook Carried in Pocket

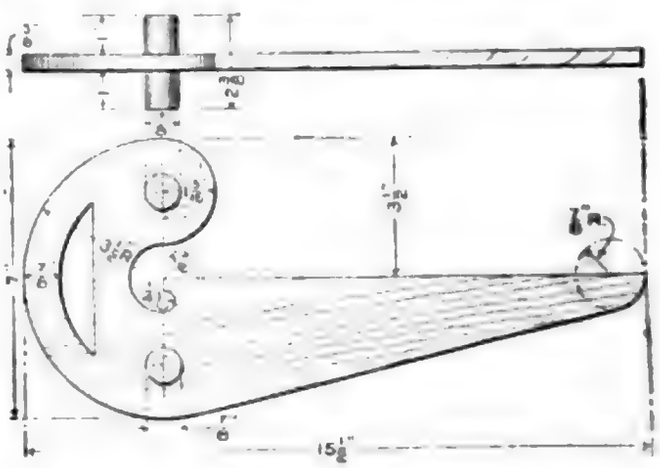
A student, who found that no place was provided to hang caps or other wraps in many of the classrooms, provided an emergency cap hook in the shape of a large glass-headed push pin. He carried this with him at all times, sticking the point into a cork, to protect his pocket. The pin can be used almost any place, and leaves no unsightly mark.

### Embroidery Hoops Used as Frame to Display Flowers

An attractive window display may be arranged by stretching a piece of mosquito netting over a common embroidery hoop, which has been dipped in paraffin to make it waterproof. The flower stems are pushed through the meshes of the netting, and the frame is floated in a flat glass dish two-thirds full of water.—E. B. Warren, Garnet, Mont.

### Tool Forms Combination T-Square and Center Square

A tool constructed according to the sketch may be used for the purposes of an ordinary T-square, but finds its principal use in marking the center of a round piece of wood. It may also be used by finding the approximate center of an uneven



A Center Square, for Use with Circular Objects of Diameter Up to Two Feet, can Also be Used as a T-Square

block of wood with irregularly curved edges. The dimensions given are suggested as those which will prove useful

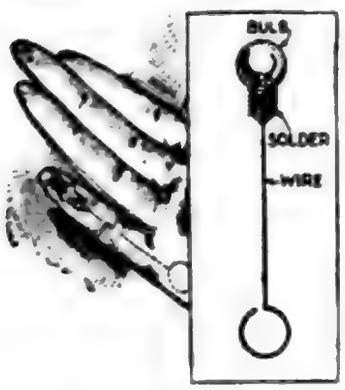
for many workmen; they can be varied as desired.—A. Handelman, Montreal, Canada.

### Catching Cockroaches

Cockroaches are a great nuisance, and are sometimes found difficult to exterminate. By means of a simple trap a place may be cleared of these pests in a few nights. Four teaspoonfuls of honey, or sirup, should be stirred into a quart of water. This is put into a basin of such a size that it fills the vessel about half full. The basin is placed upon the floor, and a few small sticks, ½ in. wide, are rested upon its edge so that they project somewhat over the liquid. The other ends of the sticks rest on the floor. The insects climb up the stick, and, when they reach the end, tumble into the basin and are drowned.

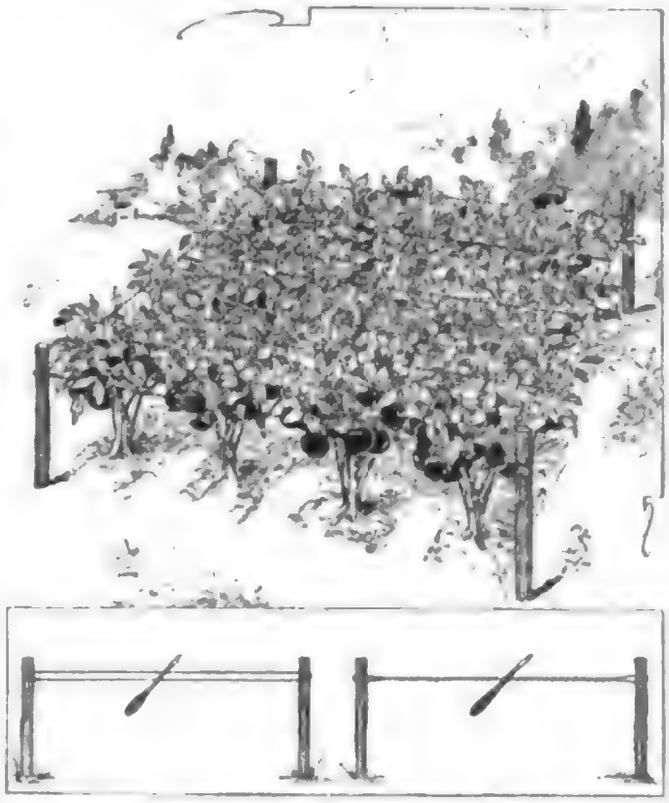
### Lamp Bulb for Mending Gloves

It is not easy to stitch the torn finger end of a glove without spoiling its shape, unless some rigid material with a curved surface is kept inside it while repairs are being made. A burned-out bulb of an electric flash light is usually small enough, and is not too easily broken. Use one that is perfectly round, without the projecting tip that is found on some types, and solder a small piece of wire to the socket end to hold it in position.—Frank W. Bentley, Missouri Valley, Ia.




### A Twisted-Wire Tomato-Plant Trellis

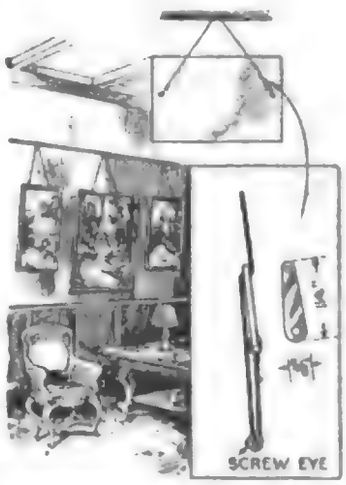
Tomato plants produce better fruit when the vine is held up off the ground by some sort of trellis. In fact, the fruit will ripen very much earlier, and be of better quality, if the plants themselves are set at least 3 ft. apart, and the rows the same distance, in addition to the use of a trellis. A few plants set in this way will outdo a larger number of plants set close together. The usual method of giving light and air space to the vines is to set a barrel hoop on stakes around the plant. A trellis, which looks better and gives better support, is made from wire twisted between posts at the corners of the tomato patch, with cross wires between the plants themselves. Since this need not be put in until the plants are too large to cultivate, it will not be in the way. The method of twisting the wire, to give tightness, is shown in the two lower sketches. —J. F. Campbell, Hudson, Mass.



**A Trellis, Made of Wire Twisted between Corner Posts, Holds the Vines off the Ground, Giving the Light and Air Necessary to Produce the Best Fruit**

### Adjuster for Picture-Hanging

A grip or adjuster, of the kind commonly used on guy ropes, is a great convenience in hanging pictures. When it is desired to hang a whole row of them with the upper or lower edges of the frames in line, it is necessary to lengthen or shorten the cord of each picture two or three times before exact alinement is obtained. This is generally done by unfastening the cord from one of the screw eyes, but the device shown, which is easily made of hard wood or fiber, removes the need of detaching the cord.

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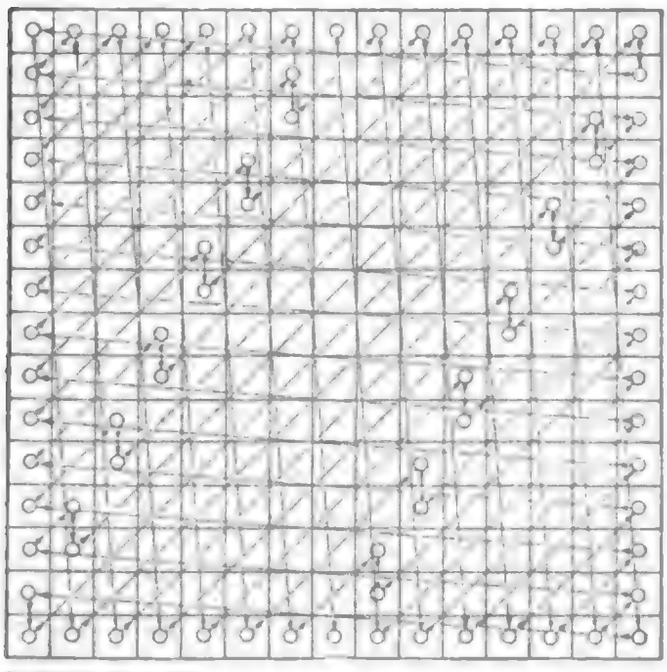
### How to Make Magic Squares

One of the old mathematical curiosities is the magic square. By this is meant an arrangement of consecutive numbers in the form of a square, so that the sum of the numbers in each horizontal row is the same, and the sum of each vertical column, or of either diagonal, is the same as the sum of a horizontal row. Many such squares have been published; the finding of the proper arrangement by experiment is a tedious task, even for small squares, and for those of 10 or more columns and rows it is out of the question. By the use of the rule given below, it is easy to construct a magic square of any size desired. The rule is illustrated in the diagram at the left, and the square at the right illustrates the result of applying the rule.

The rule, which applies only to squares having an odd number of rows and columns, is as follows: Begin by placing the figure 1 in the middle square of the top row, and 2 in the bottom square of the next column to the right. Follow with 3, 4, 5, etc., running diagonally upward and to the right. When the last column is reached skip to the left side, still moving one square upward each time. When the space occupied by 1 is reached, drop down one space, and continue diagonally upward until the top row is reached. Write the next number in the bottom square of the next column to the right, and continue the diagonal movement, dropping down one square whenever an occupied square is reached.

There are also some interesting properties of the central row and the central column of the square, and of the number at their intersection, which in the 15-row square illustrated is 113. This number is the arithmetical mean between any two numbers an equal distance above and below it, or to the left and right of it, or at the same distance from it in either diagonal. This central number, multiplied by the number of rows or columns, gives the constant number which is the sum of all the numbers in any row, column, or diagonal.—Frank H. Jones, E. M., Clarkdale, Ariz.



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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 122 | 139 | 156 | 173 | 190 | 207 | 224 | 1 | 18 | 35 | 52 | 69 | 86 | 103 | 120 |
| 138 | 155 | 172 | 189 | 206 | 223 | 15 | 17 | 34 | 51 | 68 | 85 | 102 | 119 | 121 |
| 154 | 171 | 188 | 205 | 222 | 14 | 16 | 33 | 50 | 67 | 84 | 101 | 118 | 135 | 137 |
| 170 | 187 | 204 | 221 | 13 | 30 | 32 | 49 | 66 | 83 | 100 | 117 | 134 | 136 | 153 |
| 186 | 203 | 220 | 12 | 29 | 31 | 48 | 65 | 82 | 99 | 116 | 133 | 150 | 152 | 169 |
| 202 | 219 | 11 | 28 | 45 | 47 | 64 | 81 | 98 | 115 | 132 | 149 | 151 | 168 | 185 |
| 218 | 10 | 27 | 44 | 46 | 63 | 80 | 97 | 114 | 131 | 148 | 165 | 167 | 184 | 201 |
| 9 | 26 | 43 | 60 | 62 | 79 | 113 | 113 | 130 | 147 | 164 | 166 | 183 | 200 | 217 |
| 25 | 42 | 59 | 61 | 78 | 95 | 112 | 129 | 146 | 163 | 180 | 182 | 199 | 216 | 8 |
| 41 | 58 | 75 | 77 | 94 | 111 | 128 | 145 | 162 | 179 | 181 | 198 | 215 | 7 | 24 |
| 57 | 74 | 76 | 93 | 110 | 127 | 144 | 161 | 178 | 195 | 197 | 214 | 6 | 23 | 40 |
| 73 | 90 | 92 | 109 | 126 | 143 | 160 | 177 | 194 | 196 | 213 | 5 | 22 | 39 | 56 |
| 89 | 91 | 108 | 125 | 142 | 159 | 176 | 193 | 210 | 212 | 4 | 21 | 38 | 55 | 72 |
| 105 | 107 | 124 | 141 | 158 | 175 | 192 | 209 | 211 | 3 | 20 | 37 | 54 | 71 | 88 |
| 106 | 123 | 140 | 157 | 174 | 191 | 208 | 225 | 2 | 19 | 36 | 53 | 70 | 87 | 104 |

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**The Magic Square, in Which the Sum of the Numbers in Any Row, Column, or Diagonal Is the Same, may be Readily Made in Any Desired Odd Number of Rows and Columns, by the Rule Given**

### White of Egg Used as Emergency Lens Cement

While cleaning the lens of his camera, a photographer with whom I was recently detailed on a military assignment, accidentally dropped the treasured bit of glass upon the steel deck of the battleship. The lens was a high-grade anastigmatic one, and upon picking it up, we were much chagrined to find that the shock of the fall had split the crown glass away from the flint layers. Much depended upon the picture we had been sent out to take; if we were to obtain another lens, a period of four hours at the very least would be lost in procuring it, and the event we were to photograph was to take place in 30 minutes. Our only hope was in some emergency repair, and this was accomplished as follows:

The layers of crown glass and flint glass were washed with lukewarm water and soapsuds, and carefully dried. From the

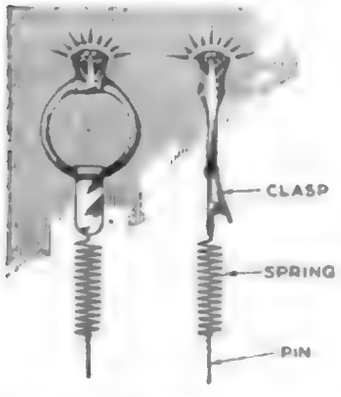
ship's cook we procured a fresh egg; using the white of this for a cement, we coated both layers of glass, and reassembled them in their barrel. Bubbles between the glass layers were almost entirely eliminated by screwing the threaded rings down as tightly as possible before the egg cement had time to dry. With this makeshift we secured pictures of good quality.—John Edwin Hogg, Alhambra, Calif.

### Shellac Retips Shoe Laces

Shoe laces are often ruined because the tips pull off and the string frays out, making it almost impossible to lace through the eyelets. An easy way to repair the frayed ends is to dip them in thick shellac, twist them into the desired shape, and allow them to dry overnight. It may be necessary to trim off some of the frayed threads.—W. F. Corenke, Portage, Wis.

### Diamonds Displayed on Spring Mounting

A jeweler, whose store faced a thoroughfare where traffic was heavy, noticed that the vibration caused by passing vehicles was communicated in a slight degree to the articles displayed in his show windows. He turned this fact to account by mounting his diamonds on light coil springs, and the oscillation, transmitted to his windows from the street, caused the stones to sparkle on the quivering wires, greatly increasing the advertising value of the display.

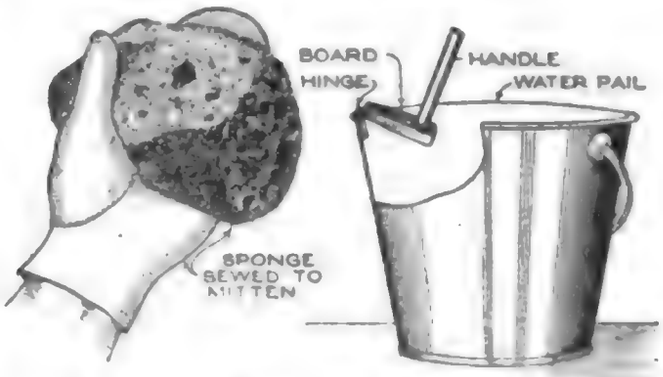



### Magnet in Broom Handle Picks Up Tacks

A common bar magnet, placed in a hole bored at the end of a broom handle, makes it possible to pick up pins and tacks while sweeping without bending over. The magnet is either wedged into the hole, or secured in it by means of a bolt running through the handle and bar. The magnet will also be found handy for loosening dirt in corners where the broom does not reach.—Abel Greenstein, New York, N. Y.

### A Sponge Mitten and Wringer

A student, who did janitor work while in college, made use of two devices to remove its most unpleasant features.

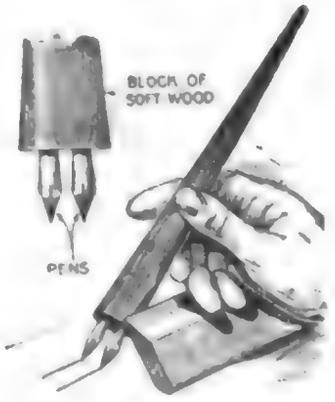



**A Little Ingenuity Exercised in Two Helpful Devices Makes Scrubbing a Less Disagreeable Task**

Part of his duty was to clean marble, for which he used a damp sponge, but as a result his hands were constantly chapped in cold weather. Accordingly, he sewed a large sponge to the palm of a cheap cotton mitten, which he made waterproof by giving it three coats of rubber cement and letting it dry overnight. His other appliance was a wringer made by attaching a small, flat piece of wood to the rim of a pail by a hinge, and furnishing it with a handle, with which pressure was applied.

### A Two-Line Ruling Pen

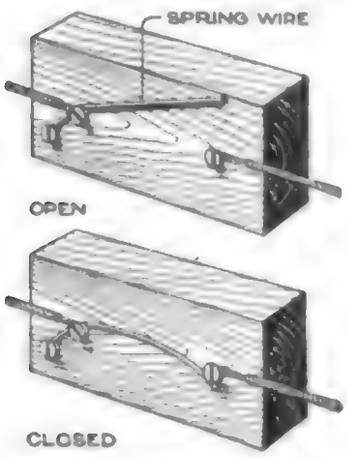
Much time can be saved in ruling lines by using a two-line pen. Drive two old pens into the end of a block of soft wood, spacing them the required distance apart. Then replace them with new pens. The distance between points can be made adjustable by driving in the old pens in a somewhat slanting direction so that the points diverge a little from each other. Pulling out the new pens then spreads their points farther apart, while pushing them in has the opposite effect. The ruler should be tilted at an angle to the paper, so as to make the handle bear on the edge of the ruler.




Kitchen scouring powder thoroughly cleans grease from machine belts and prevents them from slipping.

### Simple Switch for Experimenters

An extremely simple electric switch, suitable for temporary use on low voltage, can be made by wrapping a piece of spring wire around two of three wood screws in the manner shown in the sketch. The circuit is kept closed by the pressure of the loose end of the wire against the third screw, and can be opened by dislodging that end from the screw. A makeshift contrivance of this kind can, of course, only be used on a circuit of low-current capacity.—F. H. Rouse, San Francisco, Calif.

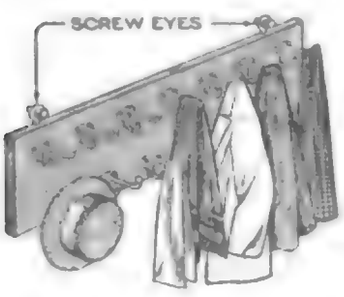



### To Keep Shoe Tongue from Slipping

A shoe tongue which does not keep its position causes continual discomfort. Fasten a lacing hook to the top of the tongue, so that the laces passing through adjacent eyelets grip it and keep the tongue from slipping down.

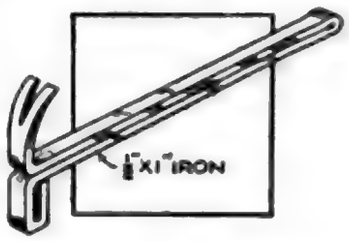
### Extra Coat Rack for Parties

The success of a party depends so much upon incidentals that it is worth while to prevent confusion by preparing extra accommodation for coats and wraps. An adjustable hall rack can be made by varnishing one side of a board, 6 by 2 ft. in size, and screwing a double row of hooks into it. Two large screw eyes in its upper edge slip over expansion bolts placed in the wall, and the rack is put into position in one or two minutes. Expansion bolts are convenient for this purpose, whether required by the nature of the wall or not, because, if the spring sockets are left in position after the rack and bolts have been removed, they will serve for all future occasions, and the wall will not be noticeably defaced.—J. Horace Van Nice, Chicago, Illinois.




### Hammer Made of Strap Iron

The peculiar claw hammer, shown in the sketch, was made in a few minutes from bar iron, by bending it over and splitting one end to form the claws, as shown. If a heavier head is desired, the other end can be bent over one or two additional times. It is well to round off the handle over almost its full length, while hot, and it improves the job if the two lengths forming the handle are welded together at some point not far from the head. The head and claws may be ground off to give them the correct shape and finish, and a hammer is thus provided which, while somewhat heavy for long-continued use, gives the advantage of great durability.—C. A. Black, Jr., Hightstown, N. J.

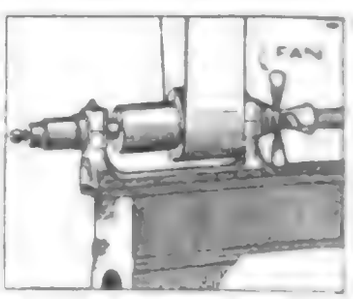



### Varnish Brush Keeps Cycle Chain Clean

A bicycle, or motorcycle, chain may be kept clean by clamping a small varnish or paintbrush to the frame of the machine in such a manner that the bristles bear lightly on the upper stretch of the chain. A small clip made of sheet metal, and a 3/16-in. stove bolt, can be used for the clamp, without presenting an unsightly appearance. The brush removes all dust and grit from the chain, thus eliminating one of the most tedious operations incidental to the task of cleaning the machine.

### Fan on Lathe Blows Away Chips

A woodworker, who was troubled with the chips from his lathe flying into his face, made use of a fan attached to the live center, as illustrated.

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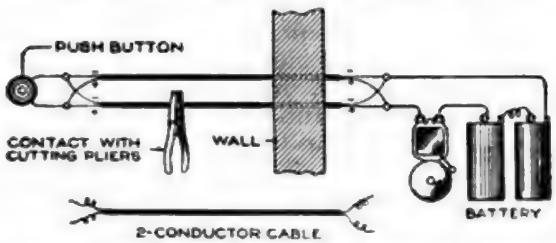
### Rubber Corks for Vibration Absorbers

Small motors which are noisy because of vibration, may be silenced by making for them wooden bases, supported on rubber corks. The corks take up the vibration, thus doing away with much of the noise. Of course, this method will not silence the whirr, but it will do much to stop the nerve-racking pounding of some motors.—Chas. Waller, Montreal, Can.

### Bell Rung When Wire is Cut

A useful device in electric burglar alarms is the method of electrical connections illustrated. The two cables are laid parallel with each other to carry the alarm or relay current, or the telephone current. The difference is that, with ordinary wiring, when one of the two parallel wires is cut, the circuit is broken; whereas, when




**Cutting One of the Two Cables, Instead of Breaking the Circuit, Leaves It Intact and Closes It for an Instant**

connected as shown, the cutting of either one of the parallel cables leaves the circuit complete through the two conductors in the other cable, and makes an instantaneous contact between the two wires of the cable which is cut. This contact is the result of the metal of the wire cutter coming in contact with both conductors.

The momentary contact would, of course, not ring the bell very effectively, if connected as shown in the sketch, but would be sufficient to close an alarm circuit through a relay. A wiring system such as this may be used in many different combinations to deceive the burglar into thinking he has eliminated danger, whereas, instead, he has given the alarm. —Joseph Magis, Ouffet, Belgium.

### Garter Clasps as Towel Hangers

Sew a discarded garter clasp to the edge of a towel or stove pad. It can then be hung from a nail or hook without any danger of tearing. The broad end of the clasp is the one to be attached to the towel, and the edge of the material should be doubled over before the stitches are made.

### Keys Made from Wire Nails

Several workmen in a construction camp kept their tools in the same locker, which made it necessary for them all to have keys. There were not enough to go round, and as the camp was far from any locksmith's shop, the shortage was supplied by makeshift keys made from nails. The blanks were formed by hammering the nails flat from the point to the middle, and turning the shank at a right angle near the head, to make the keys easy to turn. They were then placed one by one in a vise with the model key and filed into shape.—Dale R. Van Horn, Lincoln, Neb.

### To Make Fly Paper

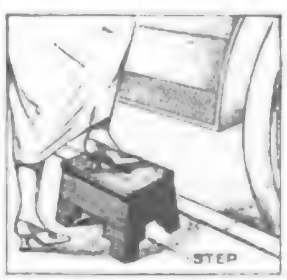
An excellent sticky fly paper can be made of materials that cost very little. Boil linseed oil, to which a small quantity of resin has been added until it forms a stringy paste when cool. Spread this, while hot, upon sheets of heavy paper, with an ordinary paintbrush, and set aside until cool. It is then ready for use in the usual way.—Mrs. O. G. Romig, Denver, Pennsylvania.

### Tires for the Carpet Sweeper

Tires for a carpet sweeper may be made by cutting narrow cross sections from an old inner tube. These are cemented to the rubber wheels with thick shellac, and serve the purpose as well as the original tires. Glue will not do for cement, as it will not adhere well to the iron.—H. J. Eberhardt, Detroit, Mich.

### Step Carried in Automobile

Portable mounting steps for automobiles prevent the inconvenience that frequently occurs at halting places when ladies or invalids are members of a touring party.




The rubber cement which can be bought cheaply in large cans for shoe repairing has produced excellent results in mending automobile tires.

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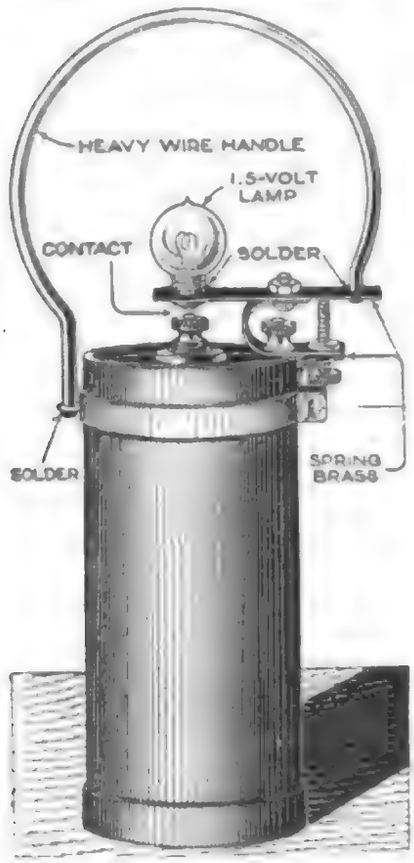
### Automatic Electric Lantern Lights When Lifted

The feature of the electric lantern shown in the drawing is that it automatically lights when lifted, and goes out when set down, unless the thumbscrew is adjusted to secure steady light in any position. One side of the handle is soldered to a metal clamp, fastened about 1 in. below the top of the battery. The other end is soldered to a strip of sheet brass, ½ in. wide and 2¾ in. long. A 1.5-volt lamp is soldered into a hole at the other end of the brass strip, so that the central contact on the lamp projects ⅛ in. below the strip. A piece of spring brass, ½ in. wide, is bent as shown in the sketch, and screwed under the negative, or zinc, binding post; then fastened to the brass piece which carries the lamp by a small bolt and nut. Another nut is soldered to the top of the spring, to take the thumbscrew shown.




When the lantern is lifted, the strain on the handle pulls against the brass spring and forces the center of the lamp base into contact with the positive, or carbon, pole of the battery, thus lighting the lamp. As long as the lantern is carried or hung up by the handle, it will remain lit, but when put down, the spring forces the lamp out of contact with the positive pole of the battery and the light goes out. The thumbscrew may be tightened to force the lamp into permanent contact. One advantage of the automatic feature is that the lantern is not left burning when not in use, unless the thumbscrew has been tightened.—Geo. Garvin, Elkhart, Ind.

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¶ Burned-out incandescent globes make good floats for fishing.

### Poorly Placed Lights Cause Loss of Trade

The lights in a confectionery hung from the ceiling above the electric fans, causing a steady flicker on the tables, which was bad on customers' eyes. Steadily the proprietor found his trade going to his competitor, whose lights were placed below the hanging electric fans, giving a steady glow, easy on the eyes. Not until the owner of the first confectionery replaced his lights so as to avoid the flickering effect, did he regain his old customers.—Hilton Butler, Jackson, Miss.

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### White Paper Makes Keyhole Visible in the Dark

When a door is located in a dark corner the keyhole is hard to find without striking a match, and yet it is not always convenient to keep a light permanently burning. Tack a piece of white paper or cardboard around, or beside, the keyhole, and it can be found without difficulty.—J. H. Moore, Hamilton, Ont., Can.

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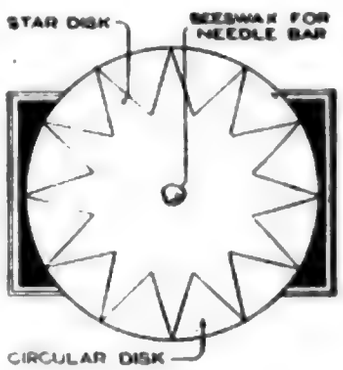
### Phonograph Diaphragms of Paper

The ordinary phonograph is furnished with one reproducer, which the maker intends to play the average record in a satisfactory way. There are many records which this reproducer will not play to suit a critical ear, because it does not bring out the individuality of the record. It is necessary to have several reproducers, in order to play each record to the best advantage.



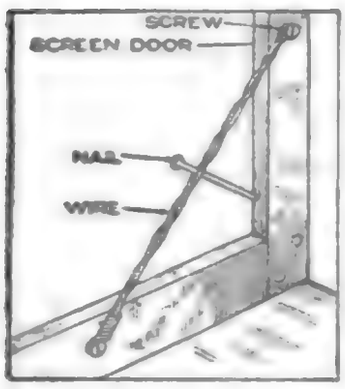

A little experimenting with paper diaphragms will reveal great possibilities. The result will be that band selections in which nothing but the brass instruments are ordinarily heard will be enriched by the tinkle of a flute, or the droning of a saxophone or bassoon. It will often be possible to remove the metallic sound of the records made by stringed instruments.

The process is quite simple. A quantity of high-grade cardboard, such as visiting-card stock, or light-weight Bristol board, will be required. Cut several disks of the cardboard to the same diameter as

that of the diaphragm used in an old reproducer cell, which can easily be obtained. From several of these disks, make star-shaped diaphragms with anywhere from 3 to 36 points. Glue these star-shaped disks to the round disks, varying the combination as much as possible, using different weights of paper and stars with different numbers of points. Give each finished diaphragm a coat of thin shellac and allow it to dry.

To try out each diaphragm, insert it in an empty reproducer cell and fasten the needle holder to the disk by pressing them together with a bit of beeswax between them. Then test the diaphragm by playing different records until it is found what class of record it is best suited to reproduce. Do the same with all of the combinations made. Each diaphragm should be classified, and marked with a number or letter, so that it can be picked out at once. The result of this work, if carefully and patiently done, will be that one can instantly select a reproducer diaphragm suited to the particular record one desires to play.

## To Prevent Screen Doors from Sagging



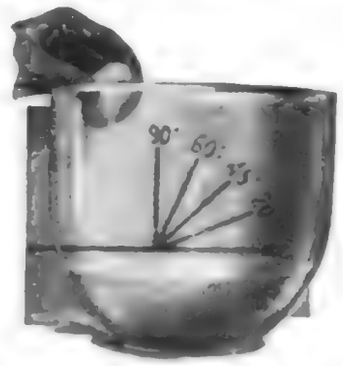

When the bottom rail of a screen door catches on the sill, connect it with the side rail by looping a wire around screws set in both rails, and twisting the wire in the center with a nail.

## Water Wings Made from Scraps of Cork

There is little difficulty in making a substitute for the cork belts and inflated bladders which beginners use in learning to swim. Collect a large number of old bottle corks, cut them into small slices, and lay the scraps between two pieces of cloth, 1 yd. square. Stitch the two pieces together, using the needle not only at the edges but all over the surface, so as to keep the scraps of cork evenly distributed. The result will be a square yard of buoyant material, from which sufficient can be cut to make two wings and a connecting strap. It should pass under the arms and across the back and breast, with straps crossing the shoulders.

## Testing Eggs in Brine

By observing the buoyancy of an egg in salt water it is possible to determine its age with considerable precision. Dissolve one part of salt in two parts of water, and pour the mixture into a large glass vessel. Place the egg in the water, and if it is not more than 36 hours old it will sink to the bottom and lie horizontally. If it is a few hours older, it will sink just below the surface and remain there, with the thicker end slightly above the horizontal. If it is between four and five days old, the thicker end will rise to an angle of 20° to the horizontal, and this angle increases with the age of the egg. Thus, 45, 60, and 75° indicate an age of 8, 14, and 21 days, respectively; and if the egg takes a vertical position it is at least a month old. The buoyancy at the thicker end is caused by the presence of an air space, which increases with lapse of time as moisture evaporates through the shell.




A practical test can therefore be made by graduating a right angle on a large card in the manner shown in the illustration, and leaning it against the glass vessel. The egg is then placed in the brine between the card and the eye of the observer, and the position in which it floats is compared with the lines indicating the different angles.

## Clock Hands Made Extra Wide for Clear Vision

One of the rooms in a factory was so large that employes working at one end of it were unable to see the hands of the clock. The dial was about 10 in. across, and so was clearly visible; but the hands were only ⅛ in. wide, and were therefore exchanged for others, 1 in. in width. While the new hands completely hid the figures, these were, of course, perfectly familiar to everybody.—E. Alpha Dean, Chicago, Ill.

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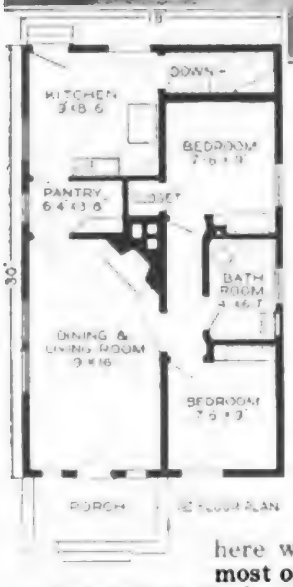
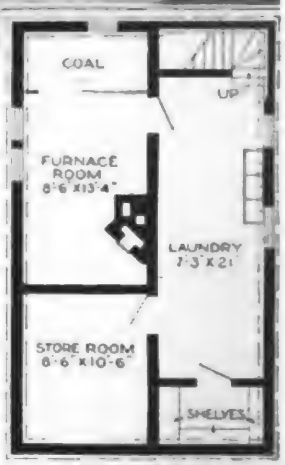
# BUNGALOW FOR A SMALL LOT AND A SLIM PURSE




The Little Bungalow Delineated in Perspective Above was Designed for a Small Lot, and Is Only 18 Feet Wide and 30 Feet Long. The Plan at the Left Indicates the Effective Use Made of Every Available Foot of Floor Space, Resulting in a Good-Sized Living-and-Dining Room and Strictly Modern Kitchen and Bathroom. A Large Chimney and Fireplace are Shown. The Basement, Laid Out at the Right, Is Notable for Its Light, Roominess, and the Separation of the Store Room from the Heat of the Furnace Room

WHEN the "own your home" spirit will not be discouraged by a narrow pocketbook, the wide economic range of bungalow design is a most comforting characteristic. Designers have demonstrated time and again that even esthetic satisfaction is not prohibited by small means if the modest dwelling is carefully planned. This is particularly true when land is cheap, but the bungalow described here was designed for a small lot as well as a slim purse, and makes the most of floor space that might easily be constricted to uselessness.

To begin at the bottom, the basement plan took advantage of a rearward slope in the lot to provide good-sized, double-sash windows in the furnace room and laundry, as well as a single sash for the coal bin. A large store room and fruit closet at the front were left dark, and kept cool by isolation from the furnace room. Though the ground plan measures but 30 by 18 ft., the laundry is 21 ft. by 7 ft. 3 in., the furnace room 13 ft. 4 in. by 8 ft. 6 in., and the store room 10 ft. 6 in. by 8 ft. 6 in. The concrete basement wall is 9 in. thick and 8 ft. high, including footings, making the rooms light, airy, and easily kept clean.

The house is built around a big chimney with three flues, one of which serves a large open fireplace in a corner of the living room. This room is 16 ft. long and 9 ft. wide, running lengthwise of the house. Used also as a dining room, a rear door opens through a pantry into the kitchen. In the center of the front wall is the door from the porch, which has concrete rails and a bracket-supported roof. There is a window each side of the door, and two more in the center of the side wall. The bathroom is small, 6 ft. 7 in. by 4 ft., but strictly modern and fitted for hot-water supply. Two bedrooms are 9 ft. by 7 ft. 6 in., and the kitchen is 9 ft. by 8 ft. 6 in., with all conveniences. There is room over the basement stairs for additional closet space. With soft-wood flooring and trim, the cost of this bungalow in village or country should scarcely exceed $1,200; hardwood finish might add $250 to that figure.

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# Popular Mechanics Magazine

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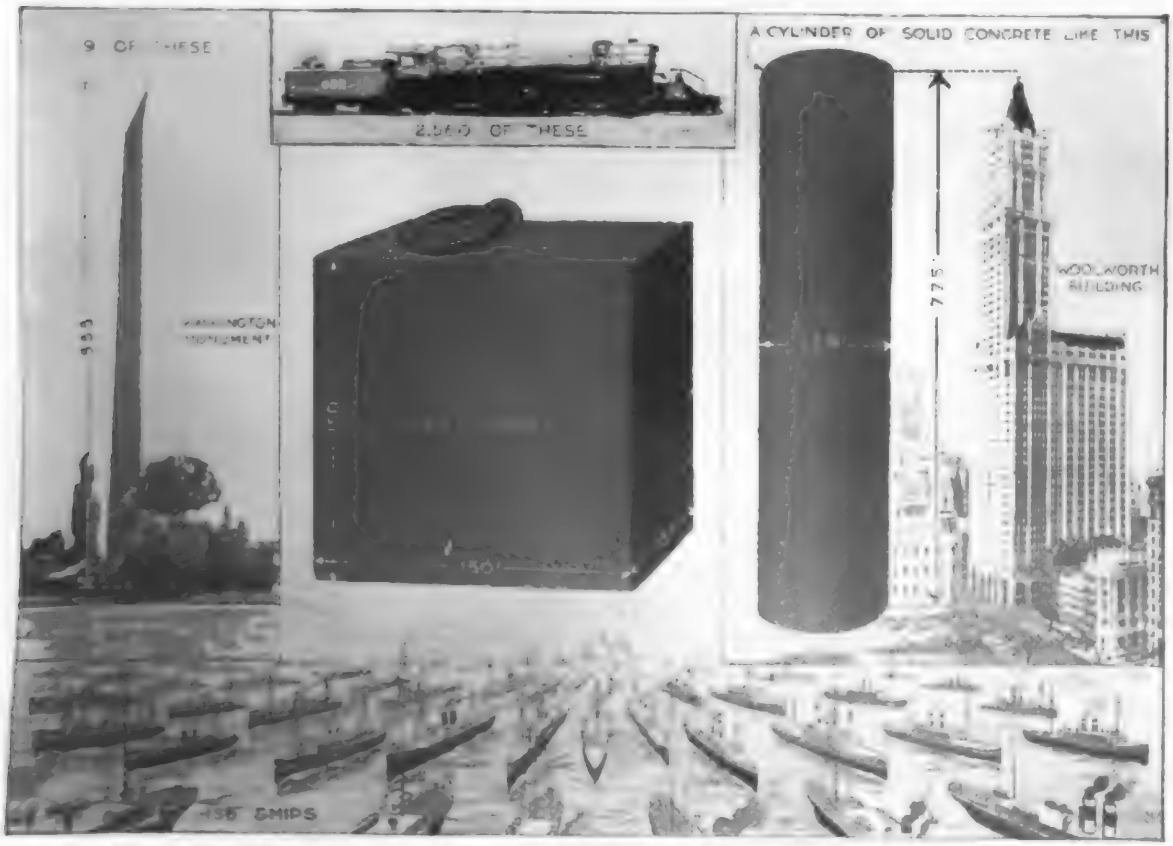
Vol. 32 AUGUST, 1919 No. 2

## One Month's Enormous Ship Tonnage

SHIPS to the number of 136, with a dead-weight tonnage reaching the enormous total of 768,025, were delivered to the government by the Emergency Fleet Corporation last May. The magnitude of this single month's shipyard output may be more readily grasped by comparison with familiar objects. "Dead-weight tonnage," in shipping parlance, denotes the total number of tons of 2,240 lb. that can be transported. This fleet of 136 vessels could carry in one trip a load equal to nine obelisks like the Washington monument; or four giant 40-story structures like the New York Municipal Building; or a cylinder of solid concrete as high as the 55-story Woolworth Building and 129 ft. in diameter; or a 150-ft. cube of cast iron. It would take more than 2,500 of the largest 16-drivewheel locomotives to equal a full load, while so far as mere weight is concerned, the entire populations of Greater New York, Chicago, Philadelphia, St. Louis, Boston, and Cleveland would not overburden the fleet, and—if people could be packed like merchandise—might be moved in a single mammoth excursion. This record month saw, in addition, the launching of 137 other ships in various parts of the country, and keels laid for 80 more. It is an interesting coincidence that the Panama Canal's record month was May, 1918, with a total cargo tonnage of 780,041.




**A Graphic Illustration of the Carrying Capacity of the 136 Ships Delivered to the Government in One Month: Nine Washington Monuments; a 150-Foot Cube of Iron; 2,560 Huge Locomotives, or a 129-Foot Cylinder of Concrete as High as the Woolworth Building**



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## DESK AND CHAIR COMBINED IN LATEST FURNITURE

For use in schools and offices, a piece of furniture in which are combined a desk and a chair, is a late addition to the market. There are two types, one of which has a small tilting desk, adjustable to any angle. In the other a larger flat desk is provided. An extension, from the point where normally would be fitted the right front leg of the chair, supports the table at the proper height. On the support is a bookrack, while underneath the seat of the chair is a large drawer. Besides the extension support, the flat desk has a hinged leg at the left front corner. Metal braces at points subject to extra strain add strength to the chair.

A Desk and Chair are Combined Here in a Neat Manner. Lower Picture Shows a Tilting-Top Desk, and the Other a Flat Top. A Drawer under the Seat and a Bookrack on the Table Support Are Conveniences

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¶ Persons willing to submit to blood-transfusion operations are being examined and listed by the medical society of a California city, so that they may be called upon in case of an emergency. Under ordinary circumstances valuable time is lost examining volunteers.

## CHICAGO'S FOREST PRESERVE PREPARED FOR VISITORS

The remarkable wilderness belt that borders the city of Chicago, perpetuated under the name of the Cook County Forest Preserve, has been well prepared for the entertainment of its 2,500,000 human neighbors. In its 15,000 acres of natural woodland the campers will find places already marked out for their fires, and free firewood actually piled conveniently near for their use, where the foresters have left it after the winter cleaning. Springs have been inclosed in concrete basins, and new wells have been driven. Along the network of concrete highways that intersect the preserve, 53 miles of which are under way, little side clearings have been prepared to invite the campers or picnic parties. At one point a dam, built at a total cost of about $500, has formed a 30-acre lake, 12 ft. deep, whose waters are discharged in a tiny cascade. The lake has been stocked with black bass and bluegills for the benefit of the amateur anglers, and a bathing beach of clean white sand formed by the simple process of placing the sand on the ice last winter and letting it sink when the thaw came. Eventually the preserve is to embrace 30,000 acres, all parts of which will be accessible by improved roads, many of them concrete surfaced.

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## DEMOUNTABLE LUMBER SHIP IS BUILT OF ITS OWN CARGO

A most remarkable 9,000-ton ship, destined to make but one voyage of 9,000 miles, is being built in a British Columbia shipyard. Its purpose is to carry 5,000,000 ft. of lumber to England; but when it arrives at its destination, instead of being unloaded, it will simply be taken apart and turned bodily into a huge lumber pile. For the new vessel is all cargo, and the cargo forms the vessel.

The method of construction is to lay down the keel and fore-and-aft cross timbers, complete a skeleton bottom, mount donkey engines on the structure, and then launch that portion of the vessel.

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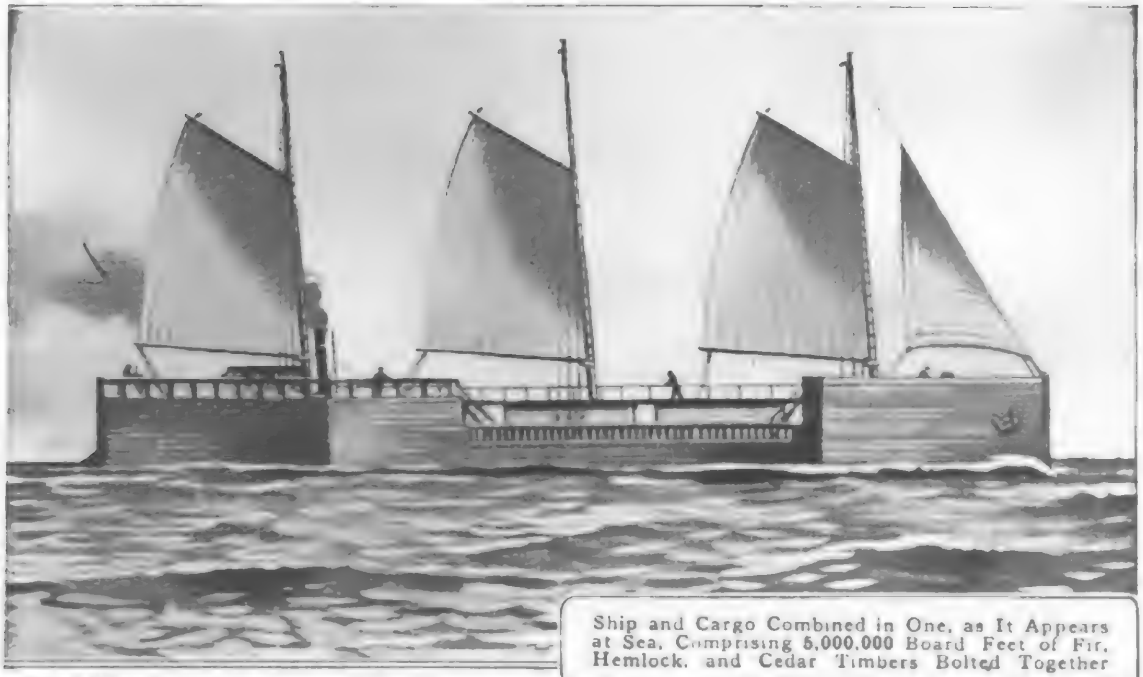

Ship and Cargo Combined in One, as It Appears at Sea, Comprising 5,000,000 Board Feet of Fir, Hemlock, and Cedar Timbers Bolted Together

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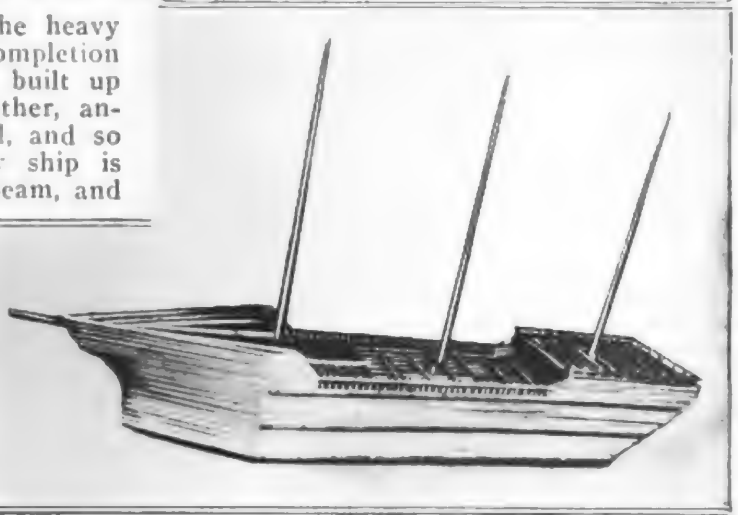
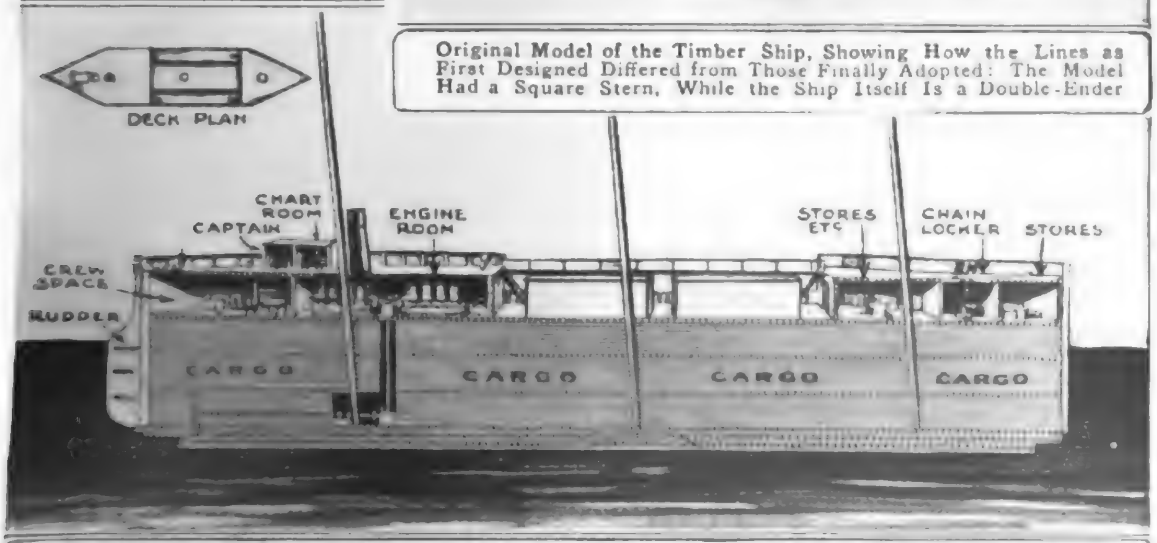
The donkey engines hoist the heavy timbers aboard for the completion of the ship. The sides are built up for 8 or 10 ft., bolted together, another course laid and bolted, and so on, until a solid, seaworthy ship is finished, 250 ft. long, 60 ft. beam, and 36 ft. deep. The sail equipment is supplemented with twin-screw drive, and comfortable quarters are provided for officers and crew. The cost is declared not to exceed that of loading an ordinary vessel.



Original Model of the Timber Ship, Showing How the Lines as First Designed Differed from Those Finally Adopted: The Model Had a Square Stern, While the Ship Itself Is a Double-Ender




Longitudinal Section, Revealing the Method of Laying the Timber Cargo to Form the Body of the Ship, and Indicating the Location of Quarters for Officers and Crew. Engine and Storage Space: In the Upper Left Corner the Shape of the Vessel is Shown by a Diagram of the Deck

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*



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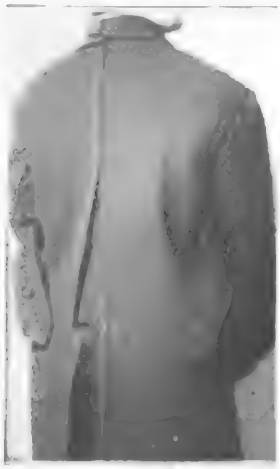
## BABY RIDES WITH PARENTS IN BICYCLE ATTACHMENT

Parents who are reluctant to leave baby behind when they go for a spin on their bicycles will be interested in an attachment designed by an Englishman for carrying a small child on his bicycle. The "go-go," as the inventor calls it, is a drum of sheet iron, attached alongside the rear wheel of the machine, with a portion cut away to afford the tiny occupant fresh air and a view of the scenery.

Child Rides Safely and Comfortably in This Attachment for Bicycles

## EMERGENCY COAT UNLACES FOR QUICK REMOVAL

Laced together with shoestrings, the five-piece coat made by a Baltimore tailor may be dismembered and removed in a minute. The garment is being urged by the maker as one for soldiers, sailors, or others who lead hazardous lives. In case of injury, where the quick and easy removal of one part of a garment is an advantage, pulling out one string will disconnect any part of the coat from the remainder. Lacing is through metal eyelets.



## MINNESOTA CITIES PROPOSE ROAD ALONG MISSISSIPPI

Another great highway to connect the North and the South is being urged by organizations in the more important cities of Minnesota. Paralleling the Mississippi River, this highway would extend from Lake Itasca, the source of the river, to New Orleans, a distance of 3,000 miles. This route would mean a drop of practically 1,575 ft. in traveling from the lake to the river's mouth. Those promoting the idea point out that the trail would not only be one of scenic interest, but that it would serve to bring about closer relations of the people in the two sections of the country.

Numerous large cities are located on the proposed trail, assuring tourists of up-to-date hotel and garage accommodations.

## NEW OPPORTUNITIES OFFERED RECRUITS IN REGULAR ARMY

The U. S. Army is offering to men enlisting for a three-year term many educational advantages. Young men possessing preliminary education may enlist in the Medical Corps with a view to training as X-ray manipulators. They will be given a three-months' course at the Army Medical School, Washington, D. C. Instructions will cover electrophysics, construction and operation of all types of X-ray apparatus, the U. S. Army X-ray ambulance, the bedside X-ray, and the portable field type of apparatus; darkroom work, photography; electrical wiring, installation, care and repair of X-ray and electrical apparatus; gas-engine construction and their care and repair, etc. Application for this enlistment should be made to the Surgeon General, U. S. Army, Washington, D. C., attention of the Chief, Section of Roentgenology.

¶Telephones are so scarce in Japan that not long ago there were 152,000 names on a list of persons waiting for the installation of instruments. Brokers deal in telephones, selling those which are discontinued at a regular market price.

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This Is the Vickers-Vimy Bomber, the First Man-Made Machine to Fly, without a Stop, across the Atlantic Ocean. The Fuselage was Crammed with Gasoline Tanks from the Nose Almost to the Tail, Space being Spared Only for the Small Cockpit in Which Sat Pilot Alcock and Navigator Brown. Either One of the Two Engines could have Driven the Plane at a Good Speed Except at the Start When Heavily Loaded

# UNHERALDED NONSTOP FLIGHT SPANS ATLANTIC

By PAUL A. JENKINS

IN writing the story of the "NC-4" one told of months spent in painstaking experiment and preparation, of destroyers and battleships strung across the ocean, and of a "slow but sure" policy which made success almost certain. In dramatic contrast to all this is the tale of the first nonstop transatlantic flight made by Capt. John Alcock and Lieut. Arthur W. Brown on June 14-15, 1919. This is the story of an airplane and two men.

Their Vickers-Vimy biplane was simply a stock model of a type supplied to the British government for night-bombing raids. As such machines go, it was far from large, having a wing span of only 67 ft. But "sweetness" of design and ease of control made the type a favorite with many pilots. Two 350-hp. Rolls-Royce engines were mounted, one on either side of the fuselage, on tubular steel struts. With this power plant the machine was rated at more than 100 miles an hour.

Alcock and Brown are anything but seafaring men. They are both land fliers, rather, but with the broadest experience in that line. Alcock has flown since 1911, often competing with Hawker and Raynham in the early days. During the war he starred in many long-distance bombing raids over Constantinople and other Turkish strongholds, finally falling within the enemy lines to remain a prisoner until the signing of the armistice. On his return to England he signed up with Vickers as a test pilot; and in that capacity successfully pleaded with his firm for permission to try the transatlantic flight. His confidence in himself and his machine were so evident that permission was granted.

Brown, the American, was likewise a prisoner of war for many months, after a career with the British army which dated back to 1914. As an aerial observer he made a name for himself on the western front, until his crash within the German lines. The odd thing about Brown is that he never had any real navigating experience before the "big hop." He had regarded navigation as a mental hobby which he studied with scholarly application. Yet he started from Newfoundland with seemingly absolute confidence in his ability to guide the plane to the center of the Irish coast. And he hit it with almost mathematical precision.

Some weeks of preparation were spent at the improvised aerodrome near St. John's, Newfoundland. Gasoline tanks were squeezed into every available cornet of the Vickers-Vimy fuselage. On seeing the skeleton before the application of the canvas covering, some one actually likened the machine to a collection of cans. These tanks held 865 gal. of gasoline, every drop of which was filtered through wire screen and chamois before entering the plane. This, by the way, was a lesson learned from Hawker's disaster in mid-ocean. With other equally elaborate precautions the preliminaries were completed by June 14.

On that afternoon, Alcock and Brown decided to wait no longer. They had seen their huge rival, the Handley Page, in easy flight above their aerodrome, and knew that haste was imperative. A nasty, choppy gale was blowing; but



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they decided to risk all. They clambered into their side-by-side seats in the cramped little cockpit. Places were found for the cat, the dog, and the four-pound sack of mail. At 12:13 p. m., New York time, mechanics jerked the chocks from before the wheels. Alcock threw both throttles wide open; the plane gathered speed for the uphill dash across the little field. Burdened almost beyond its capacity, it barely cleared hedges, trees, and houses. But as the engines fought with every bit of their power, they gradually mastered the 40-mile gale; and the biplane turned east with the wind, and streaked for Ireland. The wind, which almost prevented the take-off, now added tremendously to the speed. But the battle had been won at the cost of a broken wireless propeller, striking the Vickers-Vimy dumb for the whole of the lonely trip.

Yet the two men sped on. The wind held at their backs, but the air grew thick with fog. It continued thick. Navigator Brown made only four observations during the entire flight. Past midnight, fog thickened to snow and hail. By six o'clock in the morning both fuselage and wings were covered with ice. Brown was continually forced to climb up in the fuselage to chip ice from indicators and other essential instruments.

So they fought on until within an hour of the Irish coast. Then the weather cleared; and after 16 hours of flying, the two men rejoiced to see the coast line. Tired and happy, they decided to land at once in order to clinch the prize, which might easily be lost were they to sink off the coast of England. Alcock peered down through Brown's window in the fuselage bottom, and picked what seemed to be a good landing field. Gliding down around the wireless tower at Clifden, the weather-beaten machine touched ground, rolled a few yards, and stopped short with a jar. Alcock had completed the world's first nonstop transatlantic flight by landing in a sticky Irish bog.

They didn't care much. They had won approximately $75,000 in prize money by a record-smashing flight of 1,950 land miles in 16 hr. 12 min., about two hours less than the fastest railroad time between New York and Chicago.

They had left two other competitors back in Newfoundland. The giant Handley Page had already made a trial flight. Indeed, it was this very performance which hastened the departure of the victors. The 130-ft. bomber was a very promising competitor, too, with its four Rolls-Royce engines driving it at a speed of 100 miles an hour. The rebuilt Martinsyde was there, also, mechanics hurrying the installation of a new motor.

Other organizations were busy with preparations over in England. The Shortt machine, which fell in the Irish Sea, had been repaired. The Boulton and Paul bomber, and the Alliance entry, were about to start for Newfoundland. The single-motored Fairey seaplane was also a respected contestant because of its variable-camber wings, which permit ascension with a heavy load and great speed

PHOTO BY CENTRAL NEWS PHOTO SERVICE

The Interesting Feature of This Fairey Seaplane, Is the Adjustable Rear, or "Trailing," Edges Hinged to the Wings. By Depressing Them, the Pilot Adds to the Lifting Power of His Plane and Decreases Its Speed; by Alining Them with the Rest of the Wing Section, He Lessens Lift but Increases Speed

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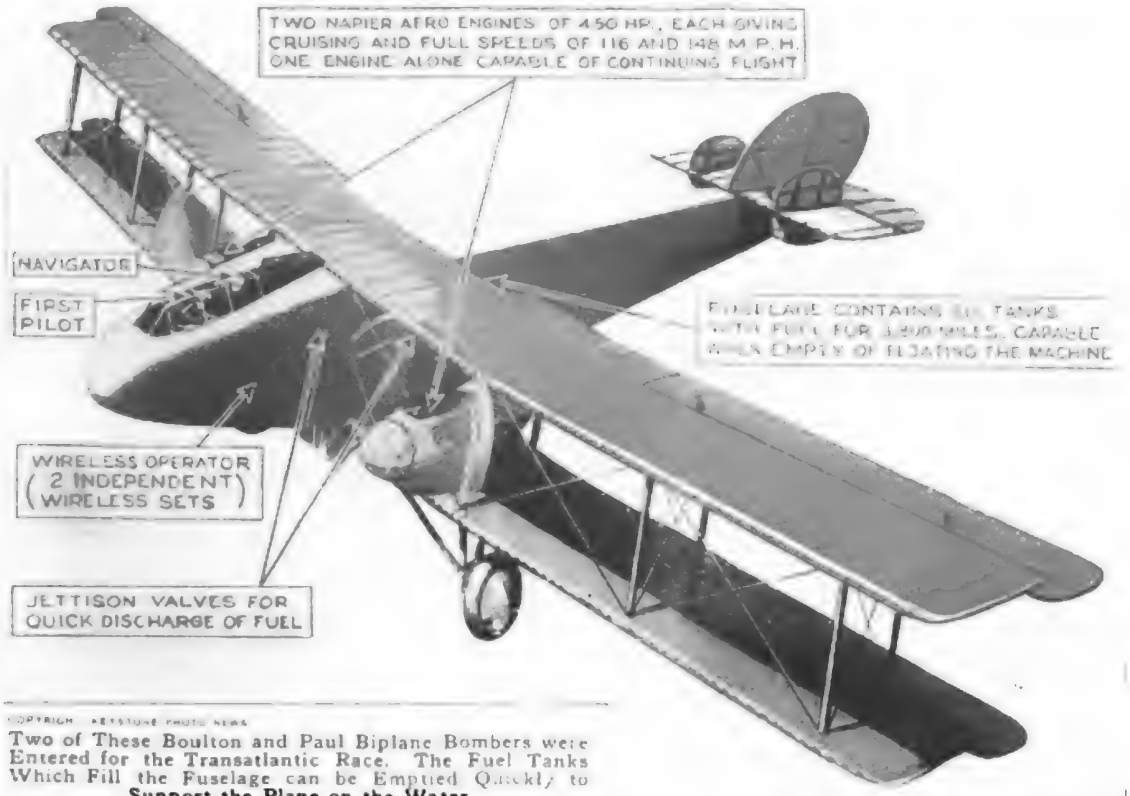


Two of These Boulton and Paul Biplane Bombers were Entered for the Transatlantic Race. The Fuel Tanks Which Fill the Fuselage can be Emptied Quickly to **Support the Plane on the Water**

on the straightaway. The four-motored Whitehead bomber and Colonel Porte's gigantic triplane flying boat were also reckoned as possible starters. It was known that transatlantic enterprises were afoot in Italy and France.

## USE FUSIBLE METAL TO STOP FOULING OF GUN BARREL

An alloy composed of 60 per cent tin and 40 per cent lead, placed in the chamber of a gun, is reported to be effective in stopping the fouling of the barrel by the copper of the shell driving bands. Firing breaks up the alloy, the tin of which joins the copper to form a new fusible alloy. This is made more readily removable by its granular form, due to the presence of the lead, which also lubricates the barrel for subsequent shots.

## SPECIAL CAR BODY CARRIES AND POURS MOLTEN METAL

A car mounted on trucks of the usual railroad type, with a body which will carry molten metal, keep it hot, or pour it out, has been designed by a Pennsylvania inventor. The car body is cylindrical, with conical ends journaled in trunnions at front and rear of the truck. It is lined with refractory material, and provided with a spout at each side, so that the metal may be poured by tilting the body either way. Holes in the spout covers allow the insertion of heating elements for maintaining the fluid condition of the contents. Lugs for attaching tackle are provided at the ends of the body so that the latter may be hoisted from the truck.

**Car for Molten Metal, Whose Body Is a Cylindrical Ladle, Pivoted at the Ends and Tilted for Pouring**

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By Drawing Out the Inner Part of This Automobile Body, Which Looks Something Like That of a Limousine, a Comfortable, Roomy Camp may be Pitched. Additional Tents, Placed at the Sides and Rear of the Extension, Enlarge the Quarters. Rubber-Tired Rollers on the Telescoping Part Eliminate Noise

## ACCOMMODATION FOR FAMILY IN TELESCOPIC AUTO

A family camping outfit is provided by a telescopic automobile body for which the inventor has asked a patent. By placing lean-to tents at the sides and rear of the extension, considerably more shelter may be obtained. The extension slides into a specially constructed body, which in some particulars resembles that of a limousine. Two swinging doors at the rear admit the telescoping part, which runs on rubber-tired rollers.

## SILENT MOTOR AND PROPELLER TO MAKE AIRPLANE POPULAR

In discussing the inconvenience and fatigue caused by the continuous roaring of an airplane's motor and propeller, a British official has declared that the elimination of all noise is not only possible, but certain to be attained in the near future. An experienced airman pays little attention to this ceaseless racket; but it is certain that the unnoticed strain on the nerves impairs efficiency and lessens his endurance. The official points out that airplaning will never be a truly popular activity until this nuisance is removed. However, he believes that flying is even now as safe and convenient as travel in a fast express train.

## NEW KEROSENE TRACTOR HAS NOVEL DRIVING SYSTEM

A kerosene-burning farm tractor, recently brought out by an Illinois manufacturer, embodies a number of unusual features, not the least important, from the driver's standpoint, being the roomy, comfortable, and convenient platform at the rear. Mechanically the machine is interesting for its driving system and spring-cushioned wheels. Sets of planetary gears are used to drive a live rear axle, reducing strain, friction, and chance of trouble, and considerably increasing the transmitted power. The floating driving wheels are turned by four-point spiders on the ends of the live axle, acting on the wheel rims through cushioning springs which effectually absorb all shocks. The machine's speed rating may be changed by removing a cover on the side of the transmission case and transposing two cross-over gears. In a few minutes, with a wrench and screwdriver, the speed is altered from 2½ and 3½ to

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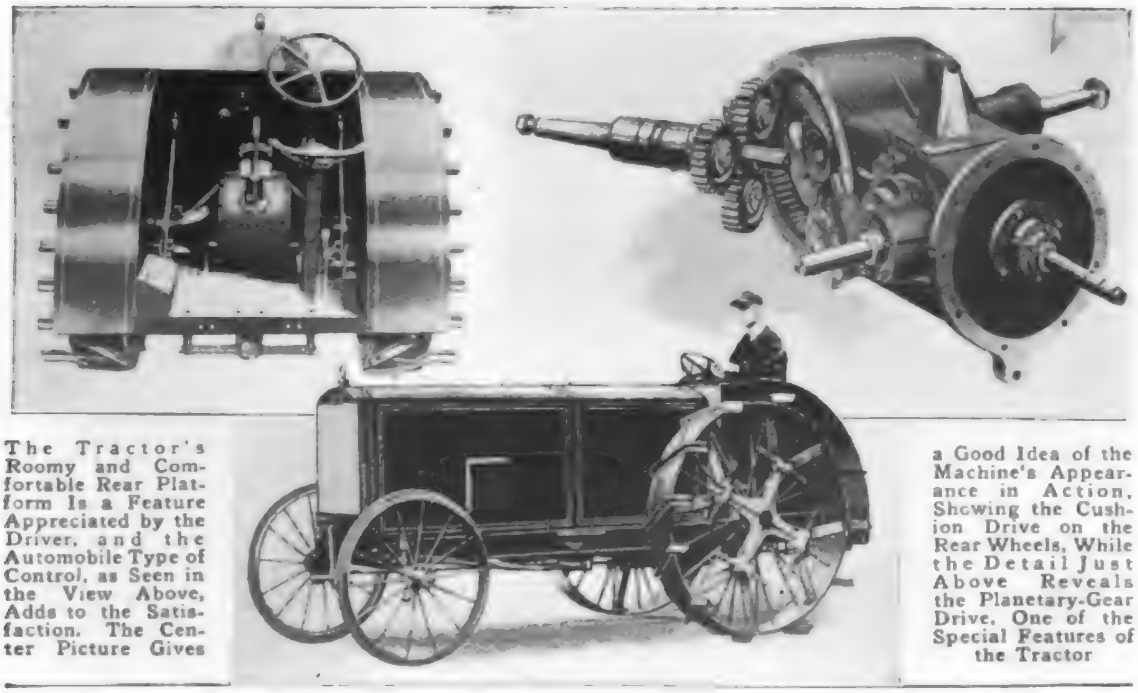

The Tractor's Roomy and Comfortable Rear Platform Is a Feature Appreciated by the Driver, and the Automobile Type of Control, as Seen in the View Above, Adds to the Satisfaction. The Center Picture Gives a Good Idea of the Machine's Appearance in Action, Showing the Cushion Drive on the Rear Wheels, While the Detail Just Above Reveals the Planetary-Gear Drive, One of the Special Features of the Tractor

1½ and 2½ miles an hour. The inclosed transmission, engine cradle, and front-axle support form a unit upon which the whole tractor is mounted, making twisted frames out of the question, and keeping all parts in alinement.

## LARGE CABIN MARKS BRITAIN'S FIRST COMMERCIAL AIRPLANE

The "Bat" commercial biplane represents one of the first attempts made by British manufacturers to break away from the customary war-time designs. The machine has been planned and built solely for the transportation of four passengers or 2,000 lb. of freight. As fitted for passenger traffic, the 8 by 3-ft. cabin is handsomely decorated, and furnished with four comfortable armchairs, a telephone to the pilot, and an altimeter and speed indicator, which tell the passengers how high and how fast they are traveling. Last, but far from least, the passengers are permitted to smoke. The pilot's cockpit is placed, very unconventionally, within a few feet of the tail, the unusual position giving him larger field of vision than he ordinarily enjoys.

¶It has been discovered that a pulp suitable for a coarse grade of paper and cardboard can be made from the larger yellow-pine chips from which turpentine, resin, and pine oil have been extracted by distillation.

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**This "Bat" Is an English Passenger Plane, and One of the First to be Built Solely for Commercial Use. The Fuselage has been Designed around the Cabin, Which Is Unusually Comfortable for So Small a Plane. Note That the Passenger at the Left is Enjoying a Cigarette without Fear of a Gasoline Explosion**

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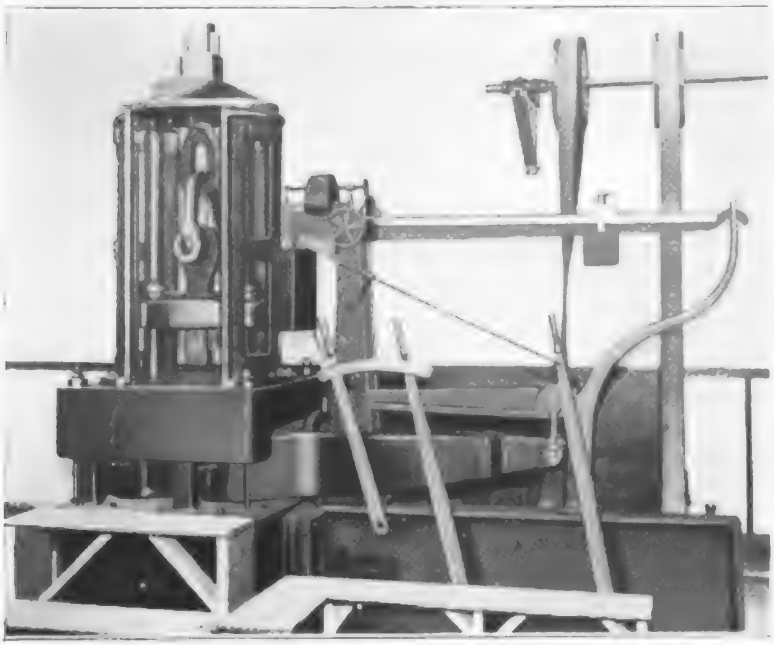
## TEST ANCHOR-CHAIN SHACKLES WITH MOTOR-DRIVEN SCREWS

A testing machine with a pulling power of 150 tons is used to try out the anchor-chain shackles for vessels of the Emergency Fleet Corporation. Motor-driven screws apply the strain, the standard test being 141,680 lb., or practically 71 tons. One out of every 25 shackles, however, must withstand 99 tons of dead-weight pull without showing any signs of failure.



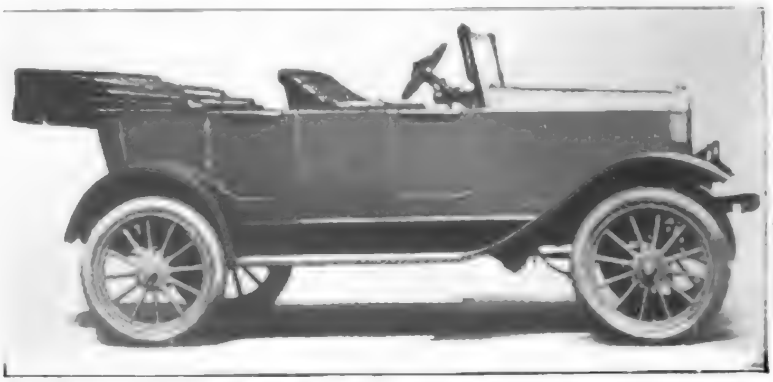
The Vertical Screws Visible inside the Testing Frame are Geared to a Motor Drive Shaft, and, When They Revolve, Exert a Pulling Force Up to 150 Tons against the Shackle being Tested

## PREHISTORIC TEXAS TRIBES THREE DISTINCT TYPES

A preliminary examination of the state of Texas, to be followed by a thorough archeological survey by the Bureau of American Ethnology, has disclosed the fact that the territory which forms the state was inhabited, in prehistoric times, by three distinct types of Indians. Those of the eastern part were agricultural people, and skilled in the manufacture of pottery, as is shown by the stone farming implements and earthenware that have been found. Hunters' weapons have been dug up in the central part of the state, indicating that the ancient tribe which once lived in that section was composed of devotees of the chase. In the extreme western portion of the state, a tribe much like the Pueblos of New Mexico appear to have lived in olden times. Texas is believed by the archeologists to be a fertile field for their operations, as the cursory examination has brought to light a wealth of material, and because the state never has been the scene of systematic research work.

## CLASSY STREAMLINE HOOD CAMOUFLAGES CAR

There has recently been placed on the market an outfit that will give to a cheap car the appearance of a much more expensive one. The change is made by using a new engine cover and cowl of the latest type: new windshield brackets which give the required tilt, and new running boards and lamp fittings. The ordinary radiator is used, but is covered by a silver-plated shell to conform to the new design. It is equipped with a modern radiator shutter. The change can be made in a day, and the car is not damaged in any way, as the standard bolt holes are used.



The Casual Observer Might be Excused for Mistaking the Identity of This Low-Priced Car, Equipped with a New Streamline Hood and Cowl, Silverplated Radiator Shell, and a Stylish Slanting Windshield

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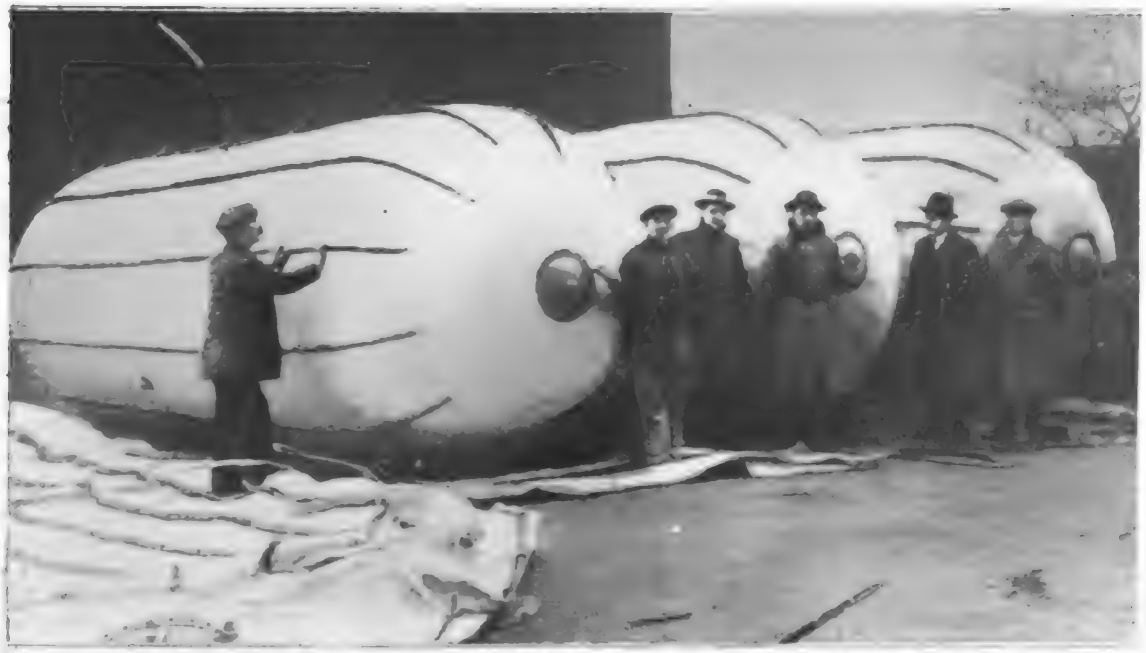

Collapsible "Camels" for Raising Sunken Ships: They are Placed Inside the Ship Deflated and are Then Pumped Up as Indicated by Three of the Four Shown in the Picture

## COLLAPSIBLE CANVAS "CAMELS" RAISE SUNKEN SHIPS

A ship-salvaging "camel" that is blown up like an automobile tire has been invented by a British naval officer, and is already doing good work among sunken vessels. Shaped like a small dirigible balloon, the camel is made of laminations of specially prepared vulcanized canvas. It is protected by longitudinal rope fenders and provided with flat flexible-steel moving bands. Three air connections at different points make for convenience in handling, and a pressure regulator prevents overinflation. Deflated, the big bags are introduced through porthole or hatchway into the sunken ship, and then air is pumped in until the vessel rises. A special steel clip for fastening to a ship's side allows the external use of the camels if necessary, avoiding the difficult task of placing cables under the hull.

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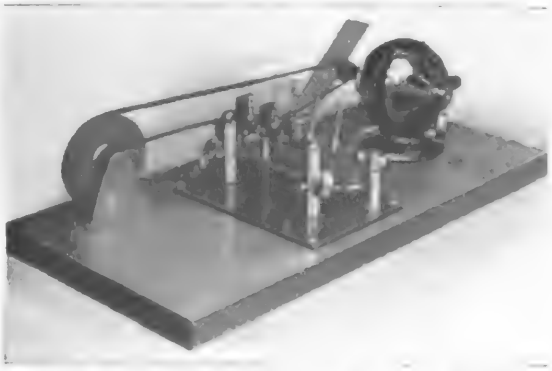
## LITTLE MACHINE TESTS CHAINS IN AIRPLANE ALTIMETERS

Modern war is fought in the laboratory as much as on the field of battle. Consider, as one of a thousand instances, the altimeters, or aneroid barometers, which were fitted to the instrument boards of the fighting airplanes. Discovering a tendency to rust and stiffen in the thread-like chain which connects diaphragm and indicator, the government asked the Bureau of Standards to produce a faultless chain. So the scientists in their laboratories built a little machine which slowly wound and unwound the chains under test, just as they would be twisted by the action of the altimeters. After the operation had been performed millions of times, the chains were microscopically examined for defects. In studying the illustration, the reciprocating action of



This Mechanism was Used in Making War-Time Tests on the Strength of the Tiny Barometer Chains Which Connect Diaphragm and Indicator

the mechanism will become clear when one notices the hairsprings under the winding drums.

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¶ The Canadian Pacific Railway has applied for a charter to operate an aerial freight and passenger service.

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## WRECKERS REVEAL NEW FRONT INSIDE OLD BUILDING

To make way for the double-decked boulevard which will some day relieve Chicago's down-town traffic congestion, it has been necessary to cut through scores of warehouses and office buildings. Considerable litigation before the rights or demands of one warehouse were determined threatened to hold up the owners' reconstruction program indefinitely. They could not proceed to rebuild while the case was in the courts, as that would jeopardize their suit. However, they secretly erected a new front, complete with windows and doors, inside the old building. This was discovered only when wrecking operations were finally resumed.

When Wreckers Demolished Part of This Old Warehouse to Make Way for Chicago's Down-Town Boulevard Improvement, They Found the New Front Already in Place

## DRAINAGE WILL RECLAIM RICH FLORIDA LAND

A large area of rich Florida land will be made available for cultivation by a drainage project about to be undertaken by the authorities of that state. The land is now covered by the waters of the St. John's River, which resembles a chain of small lakes more than a stream. About 1,000,000 acres will be reclaimed in the counties of Brevard, Osceola, Orange, and Volusia, in the central part of Florida. It has been estimated that the work will cost not less than $7 an acre, and perhaps $10 an acre will be required.

## CAR RUN WITHOUT CARBURETOR GIVES SURPRISING MILEAGE

A Red Cross chauffeur in Paris is reported to have driven his car nearly 45 miles on one pint of gasoline, using no carburetor, but condensing and spraying the fuel directly into the cylinders by a method not disclosed. This is at the astonishing rate of 360 miles to the gallon. In the absence of any information as to the weight of car or the nature of the road traversed, comment on this extraordinary figure is more or less futile. With a car of standard equipment, tuned for the occasion and "nursed" along by a trained driver, an American car maker claims a record of 83 and a fraction miles on one gallon; but 25 is generally regarded as very high indeed. If the thermal efficiency of a gasoline engine with carburetor is around 20 per cent, this inventor appears to have attained more than 100 per cent.

## SNAILS IN GLASS TUMBLER PHOTOGRAPHED BY TEXAN

Though proverbially the slowest-moving creatures on earth, snails have a way of getting to their destinations that is certain, if not swift. The photograph reproduced herewith was taken by a Texan while on a fishing trip. It shows in a glass tumbler a number of the mollusks, some of which have started on their "dash" for liberty. One appears to be much more speedy than his companions, for he has negotiated the rim of the glass, while many of the others are still at the bottom.

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This Big English Triplane Bomber, Seen in Flight from Another Airplane, has Proved Its Worth as a Reliable Freight and Passenger Carrier. The Smaller Picture at the Left Shows the Interior of the Fuselage in Which the Transportation of a Large Cargo Is Possible Because of Freedom from Obstructing Wires

## BIG TRIPLANE BOMBER PROVES COMMERCIAL SUCCESS

English advocates of the triplane construction for airplanes are pleased with the performances of the eight-ton Bristol bombers, now finding favor for commercial use. They stand 20 ft. 8 in. high, with a span of 81 ft. 8 in. and a length of 51 ft. 6 in.; yet their four Liberty engines, placed between the upper and middle wings, drive them at 125 miles an hour, while sound design makes them as responsive to the controls as a small biplane. Like most of the big machines they were designed for long-distance bombing raids into Hunland, on which they would have carried three guns and a ton of bombs. As modified for more peaceful work, they carry 14 passengers in a comfortable cabin. Elimination of cross-wires and careful arrangement of the gasoline tanks in the fuselage provides a passageway along which passengers may walk.

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This Picture was Taken from the Interior of the Fuselage and Shows the Pilot Coming Aboard

## THE SMALL STORE MOVES TO STATE STREET

By E. T. BRONSDON

HERE is the greatest department store in the world. It is an establishment which answers all the questions and quarrels raised by monopoly and the chain-store plan. It is a department store in which each department is owned and controlled by a small dealer. It is designed especially to take a fall out of the cost of living because of lessened overhead. It is the new Chicago Market, which occupies the eight floors of a former department-store building.

Are you a small merchant, selling any sort of wares, from floral horseshoes to the hardware variety? Have you longed for years to place your business on the main artery of a large city? This store will give you the opportunity.

Are you a consumer of dry goods, groceries, household furnishings, and all the

impedimenta of modern life? Have you been driven to the point of explosion by the indifference of some department-store clerks, whose bread and butter is only remotely connected with the task of pleasing you in service? Have you often wished that you could see the owner himself and straighten out the tangle?

The new market gives you every convenience of a modern department store, yet brings you in touch with the proprietor in every department. The man you talk to actually owns all the goods displayed. He is taking your money for himself. He knows that he has to satisfy you or go broke. The personal responsibility of the small-town store therefore is combined with all the conveniences to which you have been accustomed.

For the proprietor, this new idea in stores promises a chance at the immense sales of a centrally located store without the obligation of high rent. In applying for space, the lessors examine his business. If it is sound, and not connected with hocus-pocus in any way, a contract is furnished. This contract calls for a certain percentage of his total gross sales, and is figured on the basis of profit the seller makes on each article. Thus the dealer can figure his overhead on every item, and can shave prices to the point that does away with all blind competition, giving the consumer and himself the benefit. The lessors take something of a chance on their own judgment with each foot of space they rent; but in the average they expect to make a good return on the whole building.

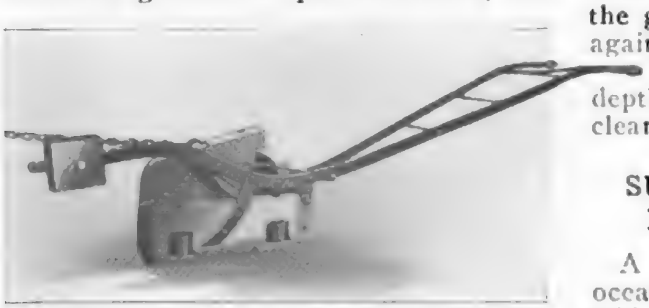
The advantages of this plan are so important both to seller and consumer that a brief statement of them is justified. The return to the consumer may be stated thus: He will buy at the lowest prices for which the best goods can be furnished; he may feel certain always that he is getting the best goods, because the promoters of the plan cannot afford to take chances on inferior articles; and because today every man who is making a success out of selling knows thoroughly that "repeat orders" are the basis of his success, the buyer may rely upon the utmost in service from any store organized on this plan.

The seller will be no less benefited. He will have his goods at the disposal of the public just where the public wants to buy; he will take no chance whatever outside the single chance he takes in business anywhere, namely, the selling of his wares; and, since his books will be audited, he will have to treat the public justly on all occasions, but for this he will be richly recompensed. In addition, he will have the advantage of coöperative buying, coöperative renting, and coöperative delivery, with coöperative collection behind him. For the man with an honest product at an honest price, all cares will vanish.

Argument—Bolshevistic or otherwise—always has claimed that the United States was heading direct into capitalistic control of all enterprise. "Trusts, chain stores, monopolies, big interests—how can the small merchant compete?" has been the line of talk. This is how.

## STREET-GUTTER SNOWPLOW KEEPS DRAINAGE OPEN

City property owners who, because of labor shortage in the winter of 1917-18, had to get out and dig heavy snow from the street gutters to open the drains, will be interested in a new English invention. It is simply a small V-plow, of redwood, shod and braced with steel, that cuts a clean 18-in. channel when drawn along the gutter by a horse. Two rollers bear against the curb, and a weight on the point adjusts the plow for varying depths of snow. With two men, it has cleared 23 miles in 14 hours.



**This Gutter Snowplow Cuts an 18-Inch Channel at a Rapid Rate, Keeping the Street Drainage Open; the Rollers Bear against the Curb, and the Movable Weight in Front Serves to Adjust the Plow to the Snow Depth**

## SUCCESS FOLLOWS MISHAPS IN LAYING OCEAN SEWER

A sewer pipe which extends into the ocean at San Francisco has finally been laid in place, after two attempts at short-cut installing methods had failed. The long pipe was first laid out on the beach, above high water, resting on heavy timber

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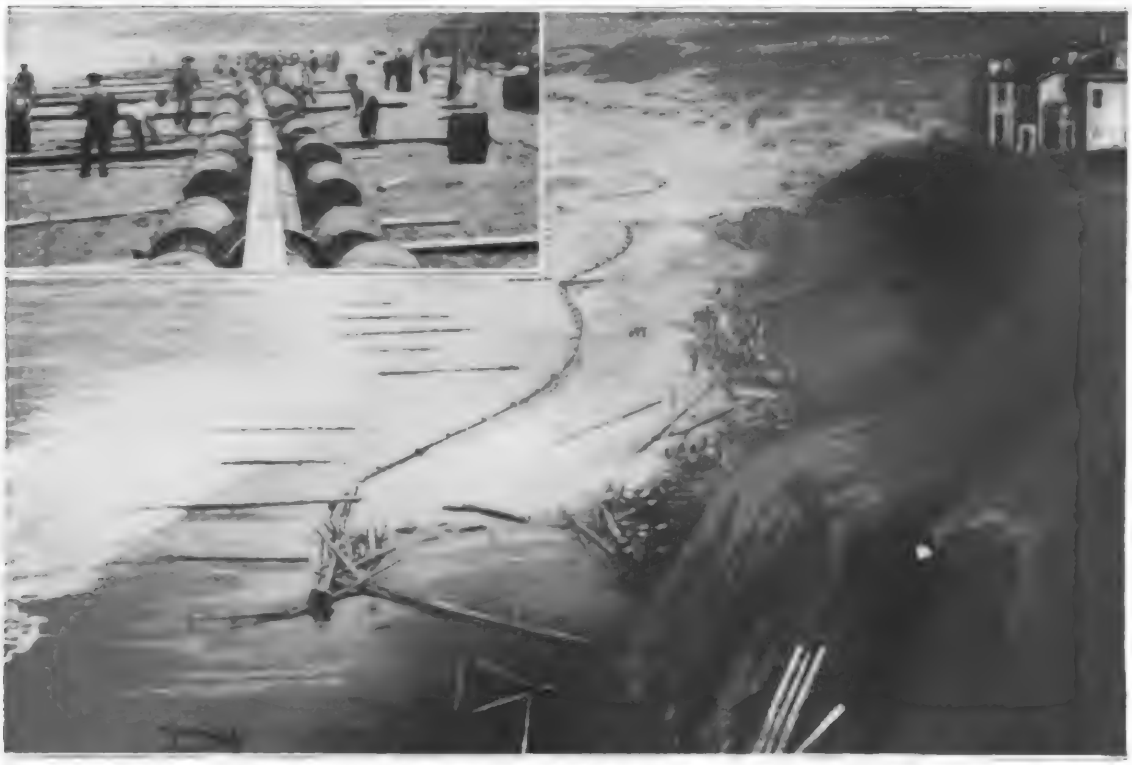

Above Are Two Views of Unsuccessful Experiments in Laying Sewer Pipe Out into the Ocean. The Long, Serpentine Curve of the Pipe Stretched Out on the Beach Indicates the Destructive Power of Storm and High Tide. The Small Picture in the Corner Shows the Method of Buoying the Finished Pipe with Barrels, but When It was Launched, the Sea Tore the Floats Loose and the Pipe Sank

The Pipes, with Floats Attached, were Moved Along into the Sea as Soon as Calking was Finished, and Then Another Section Rolled into Position; but the Method Proved a Failure. The Successful System Finally Adopted was to Build Piling the Whole Length of the Course, and Lower the Sewer from It by Cables, as Indicated in the Corner Picture

**In the Diagram is Shown the Path Taken by the Automobile Which Jumped off a 10-Foot Concrete Retaining Wall, Turned a Somersault, and Landed, Top Down, in the Creek Below. How the Car Looked Afterward may be Seen in the Picture. Miraculously, the Three Occupants Escaped Injury**

skids and cradles. Before the finished sewer could be launched and floated to its place, a severe storm and high seas threw it into useless serpentine curves. Next the pipe was formed on inclined skids, buoyed with barrels, and rolled into the sea; but the waves tore the floats off, and it sank.

The successful method employed piling driven along the location line, from which the pipe was suspended in loops of cable. After calking, the loops were lowered carefully until the drain rested on the bottom, and then withdrawn.

## AUTO TURNS SOMERSAULT WHICH ENDS IN CREEK

Noted for being the scene of many mishaps, a shallow creek that flows through a western city probably never before was involved in as spectacular and unusual an accident as when the car shown in the picture plunged into the water. The dive came as the climax to a speedy run down a street which ends just short of the bank of the stream. Dodging a tree and a lamp-post, the machine plunged over the 10-ft. concrete retaining wall, turned a somersault, and landed upside down in the water. Three occupants escaped with slight bruises. Later the car, considerably damaged, was hauled out of the creek on inclined timbers.

## MULES PUSH HAY RAKE BEFORE THEM

A hay rake that is worked in a different way has 12 long wooden prongs tipped with steel points. Two mules are hitched to the back axle, on which is the driver's seat and the lever for raising and lowering the rake. The machine is pushed toward the piles of hay, which it scoops up till it holds six or seven. It is then driven across the field to the baler, and the hay is slipped off the rake.

**"Putting the Cart before the Horse" Is the Proper Method with This Hay Rake, Which Two Mules, Instead of Pulling, Push Right into the Stack. With a Lever the Driver Then Picks Up a Load. The Rake is Seen Empty at the Left and Loaded at the Right**

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# COMMENT AND REVIEW

[These pages were printed June 21, 1919]

*Unsung Heroes*

NOT all the heroes fell in battle with its bursting shells and deadly gas, and the excitement and pyrotechnics of combat; there were, and will be, hundreds, perhaps thousands, who just as willingly gave their lives, but whose sacrifice is not printed in any list, nor written in halls of fame.

When we entered the war and there was work for everybody, many a man who had practically retired from active business, but whose ripe experience was golden, took up executive duties. Some were called away from home; others continued what they had been doing, but took on burdens far beyond their years. Into this work they threw themselves without reserve, and in a year exhausted that vitality which otherwise would have yielded them ten years more of life. Others were in the prime of life, but in positions of such great importance as to require the normal efforts of five years to be expended in one.

The war is over, the strain has relaxed, but in this city and that appear at frequent intervals the names of those who are passing away, whose lives are part of the price of war. Sanitariums for people with overstrained nerves are filled as never before, many of whom will feel the effects of war-time efforts in lessened efficiency and shortened lives. Together with those who lost lives, or limbs, or health in military service, these also deserve the appreciation of their countrymen.

*Over There and Here*

WHILE our crops in the North can almost be seen to grow, and the golden grain fields of the South are already being gathered; while industry is putting on more men and adding to its facilities; while indications promise a period of greater prosperity than any nation has ever known, we should not, in our expected success, forget the conditions which exist across the Atlantic. We have no occasion to be pessimistic—far from it—but we do need to understand conditions there, even though the picture is a painful one.

Frank Vanderlip, a banker of international experience, and a close observer, on his recent return from a study of affairs abroad, designates conditions there as "paralyzed industry," and paralyzed to an extent little dreamed of by most of us here.

Europe lacks capital, raw materials, and to a large extent industrial organization, all of which have been used up, or scattered during the war. Resumption of industries is also hindered through the loss by death of millions of skilled and experienced men, whose abilities required years to grow, and which only time can restore. Only partial crops will be raised there this year, and live stock of all kinds has been greatly depleted; fortunately our own and Canada's grain crops promise a huge yield, and with restored ocean traffic starvation conditions are improbable, but the full dinner pail is unlikely there for another year. It is to America that Europe must look for relief, and it is for us to keep a level head, both for Europe's sake and our own. This country has the opportunity of centuries to be of world-wide assistance in stabilizing and restoring normal conditions, and we must not fail in our duty, nor must we think only of ourselves.

The Financial World reduces the whole proposition to these few words: "Capital must be husbanded, long credits extended, labor must not be impatient or dictatorial, and capital must not make greed its first principle. Europe is economically diseased and must be treated with tenderness and care." We have our industrial organizations but slightly impaired; our machinery is in good working condition, being neither junk nor obsolete; we have raw materials; we have the money to operate and produce, and we have millions of skilled and unskilled laborers. What we most need at this moment is a spirit of reasonableness and coöperation on the part of both employer and employe in order to stabilize producing and working conditions. This alone can secure the largest permanent returns to both. The occasional employer who refuses to get down to earth and sit in with his men to discuss matters fully, in an honest heart-to-heart effort to get matters right, is just as unreasonable and illogical as the sympathetic strike which takes thousands of men from jobs that are satisfactory, in

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order to force the observance of some technical point between one employer and a few score or a few hundred of his men. Not all employers in these days are intolerant czars and tyrants. Those who are will, by their own stubbornness, count themselves out before long, and will have to make way for men who believe in and practice a spirit of fair-mindedness. But the many who are human surely deserve the consideration and coöperation of their men. One thing is absolutely certain: The advocates of Bolshevistic and I. W. W. principles only throw monkey wrenches in the gears, and can never get their followers anywhere but into trouble. Even though they sincerely believe in what they advocate, they are like a packing-house butcher trying to perform a delicate operation on a man's eye; he means well enough, but the patient is pretty certain to lose his sight.

IN the early part of the 13th century the Hanseatic League, which was a business organization of German towns and merchants, extended its sphere into England. These merchants brought with them a system of weights and measures which has endured until the present time, and was brought to America from England, and adopted and used here ever since. For several hundred years the Germans controlled business in England, and it remained for a woman—Queen Elizabeth—to rid the country of their dominance.

***Adopt Metric System***

In 1783, that great British inventor, James Watt, realizing how irrational was the method then in use, devised a decimal system, which he submitted to several countries. It was this system which became the present metric system. Talleyrand, the great French statesman, was quick to realize its advantages and caused it to be adopted by France. Thirty-three other countries soon adopted it also, and today, in whole or part, the metric system is in use in 200 countries. Among them may be mentioned Arabia, Archangel, Abyssinia, Babylonia, Egypt, Finland, Iceland, India, Korea, Monte Carlo, Mozambique, Palestine, Patagonia, Siberia, Sahara, Siam, Turkey, and Zambesia. China, which for years has used the metric system in 28 ports, has recently decided to extend the system to its 426,000,000 subjects. In fact, the United States and Great Britain are the only remaining countries of consequence which have not adopted it.

The Arabic numerals, 1234567890, are used throughout the world. The advantage of a world-wide use of a uniform system of weights and measures is self-evident. Indeed, one of the first things our soldiers (most of them) had to learn, on arrival in France, was the metric system. To the use of this accurate, simple system is doubtless due, in a large degree, the efficiency in production and use of the German war machine. The chief cause of difficulty in making and rejection of shells by our munition makers in 1914 and 1915 was due to our workmen who, having been trained in inches, were making ammunition in inches to be used in allied guns made in millimeters. The process today of making export goods in inches and feet, to be sold in countries where the dimensions must first be translated into centimeters and meters is so laborious and confusing and, finally, uncertain, as to work a great handicap on our sales abroad. To meet this disadvantage, our exporters are obliged to translate their dimensions into metric denominations, but even this cannot always be done with absolute exactness. If we are to attain our possibilities in foreign markets, it is of paramount importance that we go to the modern system as soon as possible.

To change any custom which has had universal use in a country for centuries seems revolutionary, and suggests all sorts of difficult problems. We like our inches and feet just as the native in some lands today likes his antiquated wooden plow which has the sentiment of centuries of use. In some of our older cities, certain streets wind about, resulting in buildings of irregular and undesirable shapes, because years ago a cow path followed the direction of least resistance. Some of these freak streets have already been corrected, and no new ones are laid out so. Our present system has no better excuse for being continued, and should be changed. Any person of ordinary intelligence can learn the metric system in an hour, and school children will master it in a fraction of the time now required to learn the present tables.

From time to time the project has received public attention, and is now being urged by the World Trade Club of San Francisco, in a logical and convincing campaign. Our readers will find the booklet issued by the club well worth reading.

With a closer working understanding of mutual interests than ever before, the present surely offers a most favorable time for Great Britain and this country to get in step with the rest of the world in this important matter.

THERE are some things which those who lay any claims to manhood, in every country in the world, scorn to do. This is true not only in civilized countries, but likewise among savages. Their code of honor forbids their doing certain things, and a savage would unhesitatingly yield his life rather than so demean himself. In fact, savages are apt to have terrible forms of execution for such offenders.

*The Language of Bombs*

Except for purposes of open and declared warfare, the bomb has no excuse in any civilized country. Even in warfare the bomb has definite limitations, and the Huns cannot in a century live down their resort to bombs dropped on enemy ambulances, hospitals, and civilian towns and districts. Of all the cowardly, unmanly, dastardly means of attack or revenge, the bomb in the hands of the civilian heads the list. It even lacks the qualities of a knife stab in the back, contemptible as that is, for that is directed against only one, who may by chance have given some personal offense to the assassin; but the bomb in its effort to reach the chosen mark as often kills or injures innocent women and children or the casual passer-by. It is placed entirely without regard to consequences, and in doing so the bomber puts himself outside the pale of civilized humanity. He becomes the scorpion, the gila monster, the mad dog, utterly without good purpose to mankind, whose speedy death is the only solution to the well-being of society. Captain Kidd's pirates had the courage and grace to fly the black flag, but the bomber works in secret and usually in darkness.

The recent attempt to attack society by sending deadly bombs to officials and men of affairs, should arouse state and national legislation to the passage of the most stringent laws, with the death penalty for conviction of the offense, and prison terms for those who knowingly had any part in it. This should include those who knowingly furnished parts or explosives; those who assisted in construction; those who harbored the makers, the bomb, or the bomb thrower. The penalty should be death even in states which have abolished capital punishment for murder, for there is a vast difference between what is known as a murderer and a bomber.

With all the freedom of speech in this country, tolerated even to the point of treason, there exists no possible excuse for the bomber, and when he attempts to speak in the language of the bomb, his efforts should be promptly stopped forever.

TUESDAY, June 17, was the 10th anniversary of the home-coming of the Wright brothers, Wilbur and Orville, after their epochal demonstration before the crowned heads of Europe. After failing to win any encouragement in their own country, the Wrights went to Europe, where their performances aroused the wildest enthusiasm. To say they "started something" is to put it very mildly. Germany impatiently awaiting "der Tag," and France and England, already sensing and apprehensive of the coming storm, instantly saw the tremendous possibilities of the airplane as a weapon of war. It is interesting to contemplate in what respects the war would have been differently fought, had there been only the old-time balloons—certainly it would have made a vast difference in many ways.

*Ten Years in the Air*

That the development of the plane has been tremendously advanced by reason of its varied service in the war is apparent; just how many years, under peace conditions, would have been required to bring the art to its present stage is uncertain, but evidently it would have been quite some time. And now it is rapidly falling into line with the automobile, and soon will attract very little more attention, though an airship, like a boat, will never lose a certain individuality. As I write these words, I can hear the air mail for Cleveland, tuning up its engines preparatory for its daily flight, yet I scarcely glance out of my window, which looks down directly upon the starting and landing field in Grant Park. The first day or two, yes; but now the regularity of the thing fails to attract. At precisely 9:20 two planes come out and warm up their engines; at 9:25 the motor truck from

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the post office dashes up, and its mail bags are thrown into whichever plane is to make the trip. At exactly 9:30 it takes the air, and in a few seconds is out of sight. At 12:20 to 12:30 the plane which left Cleveland at 9:30 drops down to the same spot, and its load is tossed out to a waiting motor truck. The arrival seldom varies more than five minutes, and is so regular in all its motions as no longer to offer a romantic sight, but has fallen to a prosaic commonplace, beside which the arrival of the 5:17 train in a country town is a frenzy. And each week the crowd which gathers to witness the departure and arrival grows smaller. Thus quickly do we pass from thrills to thoughtlessness.

That the commercial uses of the plane are being rapidly developed is evident, hastened also by the sale of army planes by the Canadian and our own government. Already express deliveries are being advertised; daily papers are delivering their editions to readers 50 miles distant as soon as to those a few blocks away; woodsmen find they can cruise more timber in a day than formerly in a month on foot; ranchmen, miners, forest rangers, all are discovering a great timesaver, and a path through the air where none exists on foot. A cañon which formerly required several days to cross on horseback can be ferried through the air in ten minutes; the arctic regions witness the sudden removal of their age-long barriers; the desert no longer burns the foot and parches the throat of the traveler; the jungle can be passed over as one steps across a brook; the most remote and inaccessible places in the world unfold their pages, which since the dawn of creation have been a sealed book. All these and many more utilities lie practically within our grasp today, and all these possibilities have opened to our reach in ten years.

Most surely the development of the next ten years will unfold some startling accomplishments. What an age in which to be living!

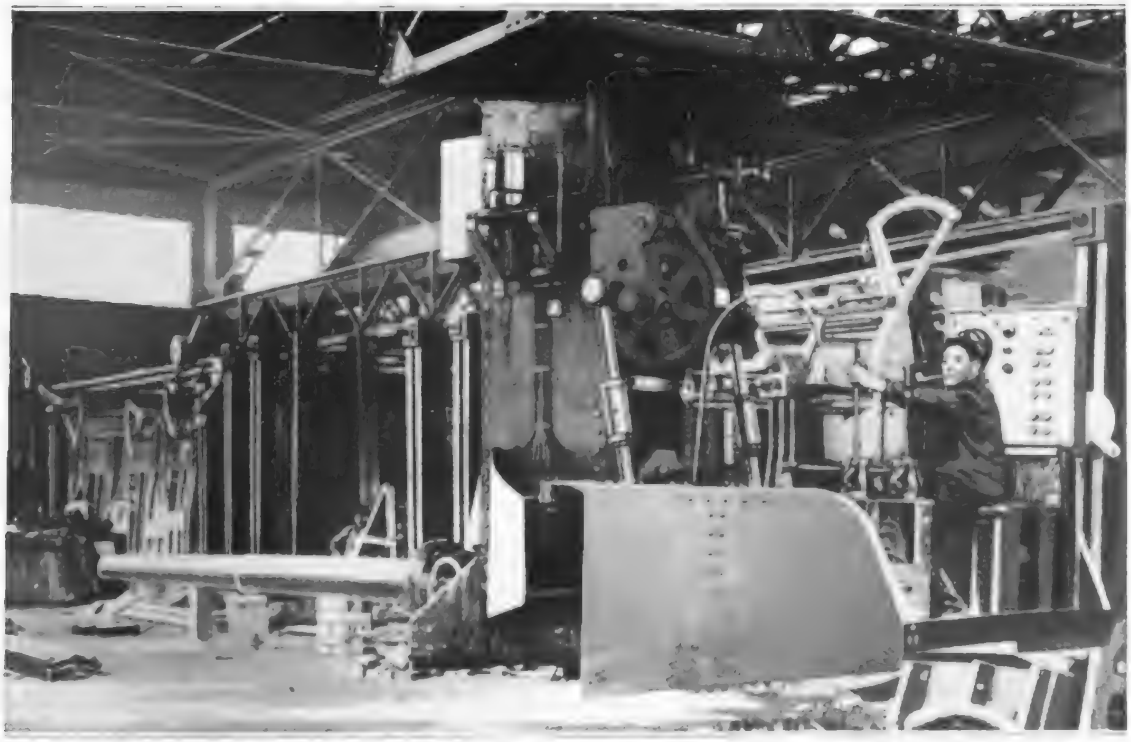
## *Plane or Dirigible*

THE Atlantic Ocean has now been crossed in a single flight of a heavier-than-air machine. Capt. John Alcock and Lieut. Arthur W. Brown, of the British army, made the passage from Newfoundland to Ireland in 16 hours. Coming so closely on the performance of our own naval effort, the attempt was rather counted on as a success, which partly deprived the gallant airmen of that full measure of public credit which is rightfully theirs. The two air voyages both confirm the possibility of ocean passage and emphasize those features which remain to be worked out before a dependable and reasonably safe service can be counted on. The trail has been twice blazed, however, if a voyage of 2,000 miles through fog can be said to mark a path, and the experiences of the crews provide a basis of incalculable value. As suggested in these pages last month, the ultimate trans-ocean passenger airship will be quite different from those now in use. As Captain Alcock says: "Our flight has shown that the Atlantic flight is practicable, but I think it should be done, not with an airplane or seaplane, but with flying boats."

Some still insist the dirigible will be the type of long-distance passenger ship, in spite of its great bulk, and unwieldiness when anchored in a high wind. Obviously a huge dirigible cannot hold its own against a severe gale, but neither can an airplane make much, if any, progress, and even big ships are at times forced to come about and run before the wind. It is, however, conceivable that the airship, of whatever type, might rise above the gale which the water-borne vessel cannot escape.

Before these lines can reach our readers, the English dirigible "R-34" will have made its venture to cross our shores, and will succeed, it is to be hoped, in good time and without misadventure of any kind. The completion of the round-trip voyage will furnish a wealth of experience, as a result of which experts on air craft will doubtless be able to decide which type of airship gives the greater promise of permanent adoption. It is in a sense the parting of the ways in which the plane and the dirigible are on trial. This, however, chiefly as a trans-ocean vessel, for the plane has its own exclusive possibilities for certain overland purposes, which the lighter-than-air machine can scarcely hope ever to serve. Each has its distinctive advantages: The plane is much faster, and the dirigible can remain above the water while repairing its engines. The over-sea trip of the English dirigible will mark a big page in the world's history of the air.

H. H. WINDSOR



This Huge Electrically Driven Charging Machine Travels before the Open-Hearth Furnaces in a German Foundry, Handling Charging Boxes, Seen at the Extreme Left, Filled with Shell Cases to be Melted into Ingots for the Manufacture of Rails and Other Peaceful Commodities

## GERMANY IS MAKING SHELL CASES INTO PIG IRON

As rapidly as possible, all the unused shells in Germany are being converted into commodities more useful to peace-time pursuits. The procedure, carried out under orders from the allies, is to extract the explosive, remove the copper rotating bands, and then turn the empty cases over to the foundry. There they are melted up by the open-hearth process. A huge electrically driven charging machine picks up a charging box full of cases, carries it on the end of a beam to the furnace, thrusts it in and dumps the box by inverting it. Cast into ingots, the steel is then sent to the rolling mill.

## TELEPHONE CALLS RECORDED BY TELEGRAPHIC DEVICE

When leaving the office or home for a few hours one will not have to wonder, upon returning, whether the telephone has rung during his absence, if the instrument is equipped with a recently invented device for recording calls and other information. Briefly, this is a telegraphic receiving machine, printing dots and dashes on tape, compactly built and fastened to the base of the telephone. When an operator finds that she cannot get an answer to her signal, she reports the fact, and any message the caller may desire is delivered to a telegrapher, who transmits it in the regulation manner to the recording instrument. Tape sufficient to record 60 messages may be put on a reel which is part of the device.

An Instrument for Leaving Messages with an Unanswered Telephone Call has been Invented. Dots and Dashes are Printed on Tape by the Device, Which is Operated by a Telegrapher at the Exchange

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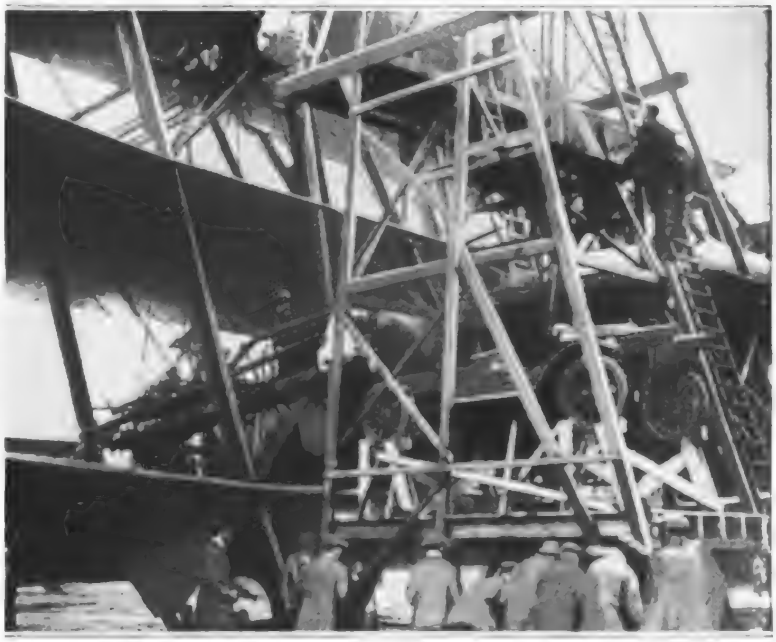
The British Government Authorized Mr. Tarrant to Build This Mammoth Triplane as an Experiment in the Construction of Airplane Framework. The Wing Spars Were Wooden Girders, Resembling Steel-Bridge Members, but Built in a Novel Way That Eliminated Rivets and Bolts. Extending His Idea, the Inventor Fashioned the Fuselage of Wooden Rings Connected by Wooden Girders Running from Nose to Tail. The Fuselage Interior Thus Served as a Large Unobstructed Compartment, in Which Tons of Freight or 100 Passengers could be Carried. The Whole Framework was Overlaid with a Two-Ply Wood Veneer, and Covered by a Waterproofing of Enameled Fabric. Six Engines of 500 Horsepower Each were to have Lifted the Mass of 22 Tons

# LARGEST AIRPLANE CRASHES IN TRIAL FLIGHT

AT daybreak of a recent Monday morning, Mr. Tarrant, his aides, and a number of government experts assembled at Farnborough aerodrome, England, before the balloon shed which had housed the Tarrant triplane during the 13 months of its construction. It was rolled out on the tracks prepared for this, its trial flight. Dwarfing everything in the vicinity, it stood 37 ft. 3 in. high. Top and bottom planes measured 98 ft. 5 in. in span; the larger middle plane, upon which the ailerons were hinged, measuring 131 ft. 3 in. Between middle and bottom planes was secured the cigar-shaped fuselage, stretching 73 ft. 2 in. from the blunt nose to the biplane tail at the rear. On either side of the fuselage was a pair of 500-hp. engines, driving a two-bladed tractor and a four-bladed pusher propeller. Above each of these double power plants was a single engine driving a tractor propeller.



As the Two Upper Engines of the Tarrant Triplane Were Approximately 28 Feet from the Ground, It Was Impossible to Crank Them Until This Automobile was Slung in the Staging and Used as a Starter

The experts were particularly interested, as the big plane was not only a radical departure from accepted standards of design, but was in many ways, an experiment in the use of wood for airplane construction. The spars which formed the backbones of the great wings were wooden girders, similar to the members of a steel bridge. By using the same construction, the fuselage was suited admirably for freight and passenger carrying. Circular "girders" were strung along longitudinal girders which ran from nose to tail, eliminating the usual maze of diagonal wires and braces. Inclosing all, was the skin of molded, two-ply veneer, covered with fabric, varnish, and enamel.

This Is the Tarrant Triplane at the End of Its Unsuccessful Attempt to Leave the Ground. The Abrupt Application of Power from the Upper Engines Threw the Machine on Its Nose

At 5:30 a. m., the six engines tuned to concert pitch, the crew entered the door halfway down the fuselage. Walking forward, they passed between the gasoline tanks to the engineers' compartment, where all engine controls and gauges were ranged on a bulkhead. The two engineers took their seats, while the pilots climbed up a short ladder, through the bulkhead, and into their cockpit in the very nose of the fuselage. Here they took their stations in comfortable wicker chairs, before the twin controls.

Speeding up only the four lower motors, they felt the towering triplane move out under its own power for the first time.



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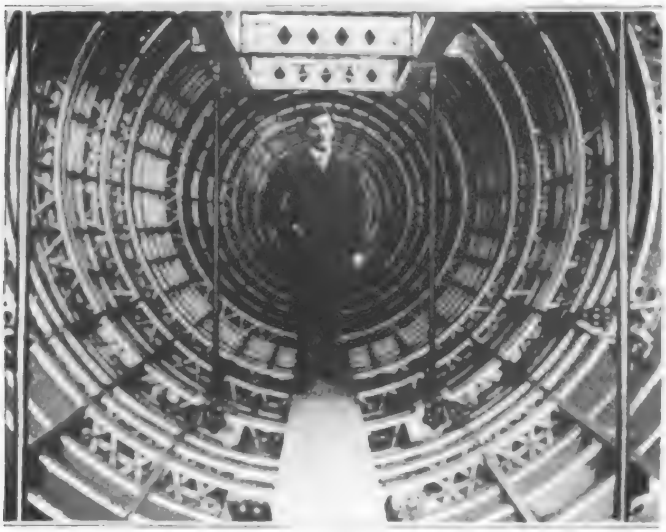
Despite its enormous weight, it taxied swiftly over the ground. Satisfied with this, they decided to take it into the air at once. Opening up the two last throttles, the upper engines took hold, and upset the whole top-heavy mass. The tail described a wide arc as the nose crashed its way six feet into the soil, killing one pilot, injuring the other, and completely ruining the fore part of the machine. Regret is general that the peculiar girder construction was not tried on a machine of less radical design.

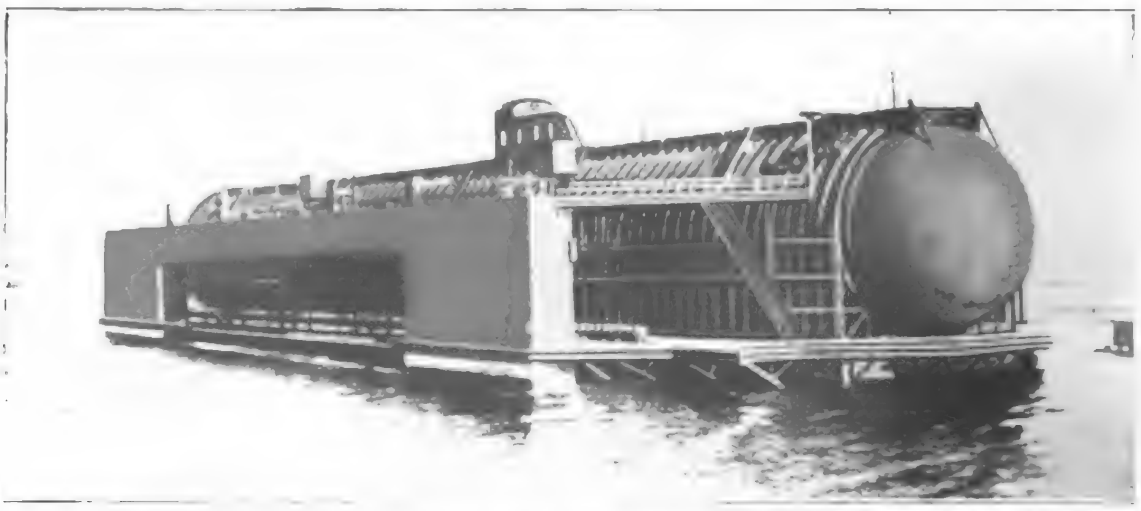


**This Interior View of the Tarrant Fuselage Shows How the Rings were Secured at Intervals along the Wooden Girders. Its Rigidity was Proved in the Fatal Trial Flight**

## CRYSTALS REPLACE BATTERIES IN TELEPHONE CIRCUITS

The phenomena of "piezo" (or pressure) electricity have been recognized for years, but interest has lagged until the recent disclosure of experiments made by a research engineer in the employ of an electrical concern. It has been known that pressure applied to a crystal in a certain way results, like a change in temperature, in developing positive and negative electricity on opposite ends of the little mass. With only a single distortion this electric energy is quickly dissipated; but by alternating high and low pressures with great rapidity a considerable electrical effect is obtained.

It occurred to this engineer that the vibrations of the human voice or of a musical instrument were ideally qualified to produce high-frequency distortion. As an experiment he mounted a phonograph needle in a crystal of the familiar Rochelle salt. Holding the needle on a rotating record the vibrations generated enough electricity to operate a number of receivers mounted in series. From this it was but a step to substituting the crystals for dry-cell batteries in telephone circuits, as a means of transmitting and amplifying sound.



DRY DOCK WITH HUGE TANK USED FOR TESTING GERMAN SUBMARINES

BATTLE-SCARRED submarines of the German navy undoubtedly spent much of their time "in the shop" during the last months of the war, and elaborate equipment was provided for their repair and testing. The method of test was to inclose the sub bodily in a tube, into which, when the entrance had been sealed, water was pumped at pressures corresponding to all depths of submergence. A giant tubular tank of this sort, combined with a dry dock for repair work, was located at the north end of the Kiel Canal, and forms the subject of this picture.

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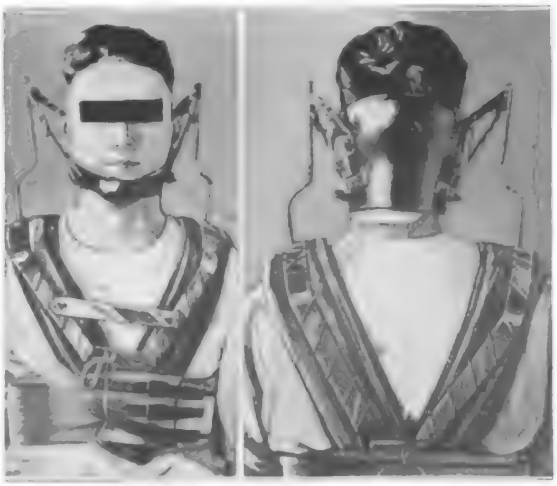
**Parades That Included as Features Such Curiosities as Gigantic Animated Cans of Tooth Paste, and Huge Perambulating Padlocks, Marked the First Leipsic Fair Since 1914, and Seem to Indicate that German Merchants are Still Looking for Business, in Spite of Their Wails of Distress**

## NOVEL ADVERTISING MARKS LEIPSIC FAIR

The Leipsic fair was held this year for the first time since the war started. This would seem to demonstrate that Germany is neither helpless nor down and out. During the fair manufacturers advertised their goods by many novel devices which were exhibited in the processions calling attention to the celebration. A Nurnberg lock maker had men bearing great padlocks, while a tooth-paste dealer used gigantic samples to call attention to his wares.

## AIRMAN'S BROKEN NECK CURED BY IMPROVISED APPARATUS

How an American army flier, whose neck was broken by a fall, recovered and reëntered the service, was briefly told in Popular Mechanics last March. Now that a permanent cure has been effected, the apparatus that accomplished so extraordinary a result is disclosed. Devised for the occasion by the army surgeon in charge of the case, it took the form of a rigid support for the patient's head, with adjustments which kept the neck sufficiently stretched to separate the injured vertebræ. A sole-leather pad for chin and neck was made from a plaster cast. A metal yoke fitted to the shoulders was inclosed in leather pads held rigidly in place by a firm body harness. To the metal yoke were soldered upright rods of metal, extending well up toward the top of the head, and the neck pad was strapped to the tips of these rods. Wing nuts at this point were screwed up to greater tension each day, until the patient's head resumed its normal attitude. Oil massage was used, but the support was never removed until X-ray exposures indicated complete restoration. Seven months after his fall, and three months after this special treatment commenced, the injured officer successfully passed the air-service examinations again.



BY COURTESY OF THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

**Front and Back Views of the Ingenious Harness That Cured an Airman's Broken Neck and Restored Him to the Service: The Head was Held Rigid by Leather Pads Strapped to Iron Uprights, Which were Soldered to a Metal Yoke on the Patient's Shoulders, a Body Harness Keeping It in Place**

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The Soldier of the American Army of Occupation is Rewarded for a Climb to the Citadel of Ehrenbreitstein by the Farther Bank Broken by the Mouth of the Mosel, and in the Angle Formed by the Intersection of

## SUBWAY FOR LIVE STOCK STOPS CATTLE KILLING BY TRAINS

A grade crossing, where for years farmers suffered heavy losses through the killing of their cattle, has just been eliminated by the construction of a steel and concrete viaduct. When the highway was put under the railroad the farmers suggested to the highway commission that the new road be designed for both regular traffic and live stock. Accordingly a six-foot strip under the viaduct was set aside by a concrete abutment that divides the road. Upon this a wooden chute was built with cross cleats of wood to assure the cattle a safe foothold, and no live stock gets killed now.

The Left Half of the Subway, under a New Steel and Concrete Viaduct, is Intended for the Use of Cattle; the Runway Is Six Feet Wide, Separated from the Highway by a Concrete Wall, and Floored with Wood. Many Cattle were Formerly Killed at This Dangerous Crossing

## MINE LABORATORY TO OPEN WITH RESCUE CONTESTS

Miners from all parts of the United States are expected to take part in contests in rescue work and first aid to the injured drill, which will form part of the dedicatory ceremonies that will mark the opening of the new laboratories and workshops of the Bureau of Mines, at Pittsburgh, Pa., during the latter part of September. Cups and medals will be awarded the winning teams, while souvenirs, in the form of badges and banners, will be given all who take part in the contests. At the last safety-first meet, in 1911, there were 18,000 miners present, and more are expected at this year's affair. Another feature of the dedication will be the staging of an actual coal-dust explosion in the experimental mine of the bureau, 13 miles from Pittsburgh. The new laboratories and workshops cost nearly one million dollars.

## AMERICAN FLAG FLIES HIGH ABOVE COBLENZ

The American flag is the last of many conquering flags to float from the battlements of Ehrenbreitstein, the towering citadel which dominates the city of Coblenz. From the ramparts of that "im-

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FROM UNDERWOOD & UNDERWOOD

**This Sweeping Panorama. He Sees beneath Him the German Rhine in Sparkling Progress Northward to the Sea; the Two Rivers the Colossal Statue of William I, His Regal Back Turned on the Old City of Coblenz**

pregnable" fortress the American doughboy looks down on the Rhine and Mosel rivers as they flow together; looks down, too, on the colossal equestrian statue of William I, grandfather of the last mad William. Behind the statue, in the angle formed by the confluence of the rivers, lies the city, one of the oldest in an old land. Records prove the existence of a military post at this point even at the birth of the Christian era.

## WOMAN'S ALTITUDE RECORD GOES TO FRENCH AVIATRIX

The famous French aviatrix, Baroness de la Roche, recently flew to an altitude of 15,700 ft., driving the little Caudron biplane with which the late Jules Vedrines landed on a department-store roof last January. The performance has been checked by a commission from the French Aero Club, giving the baroness the woman's altitude record. It was formerly held by Miss Ruth Law, of America, who climbed to 14,701 ft. at Peoria, Ill., in 1917.

## MUNICIPAL RESTAURANT LOWERS LIVING COST

High prices in the eating places of Brest, France, caused the city authorities to open a municipal restaurant especially for working people who find it necessary to eat one or more meals each day away from their homes. A public building was remodeled, and tables sufficient to seat 160 persons were placed in it. Meals in the restaurant cost approximately 43 cents, and include soup, meat, fish or eggs, one vegetable, dessert, and a quantity of either wine or beer. Regular salaries are paid all employes except the waitresses, who receive about two cents for each meal served. Tipping is not allowed.

## NEW MONUMENT CONSTRUCTION THAT SAVES EXPENSE

A monument, in the construction of which a new method was applied, was recently unveiled in Centreville, Md., in honor of the local heroes in the world war. Concrete was poured into a prepared mold after a 7-in. steel pipe, 12 ft. long, had been placed in the center. Into this pipe a 65-ft. flagpole was placed. A white stucco finish gave the monument the desired effect.

**Effective Monument of Poured Concrete with White Stucco Finish: An Iron Pipe, Cast In, Holds a Flagpole, with the Effect Seen at the Right**

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## MILEAGE RECORD ESTABLISHED BY SOLID BUS TIRE

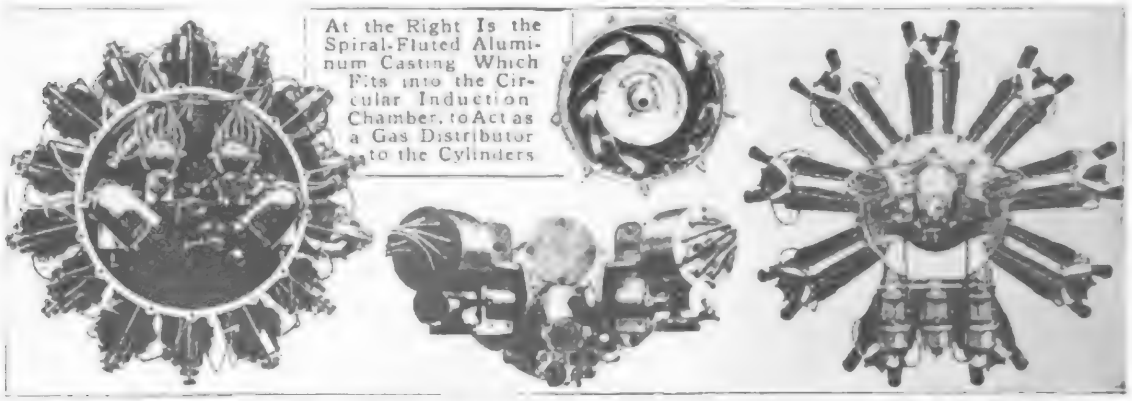
Tire-mileage records have kept pace with growth of the automobile industry, and the latest tire figures would have been unbelievable a few years ago. A solid tire recently was retired after serving for 100,123 miles on the left front wheel of a New York omnibus. This tire, 34 by 5 in., was put on the wheel May 20, 1916, and taken off March 6, 1919. When removed, it was 1 3/16 in. high, with 7/16 in. of tread rubber left. During the nearly three years of service, the tread had worn down 1 1/16 in., which is at the rate of about one inch to every 59,332 miles of travel. The makers of the tire believe this establishes a record.

## NINE AND FOURTEEN-CYLINDER RADIAL AIRPLANE ENGINES

An English manufacturer has succeeded in producing efficient airplane engines of the radial type, and offers two models, one with nine and the other with 14 cylinders. In the first, the nine cylinders, arranged in a circle, work on a single-throw crankshaft through a master connecting rod. Three carburetors on the crank-case cover feed their mixture into an annular chamber, in which a spiral aluminum casting of ingenious design distributes it to the cylinders in correct order. The 14-cylinder model is arranged in two circular rows of seven, acting directly on a two-throw crankshaft, each crank carrying seven connecting-rod heads. The carburetors supply a circular chamber, from which individual pipes lead to each cylinder. This model is 3 ft. 5 3/8 in. in diameter, weighs complete 582 lb., and develops 315 to 347 hp. at 1,800 to 2,000 r.p.m. The cylinders are 4 3/8 by 5 13/16 in. The nine-cylinder model, with cylinders 5 3/4 by 7 1/2 in., develops 450 to 500 hp. and weighs 662 lb. complete.

## "SEVENTEEN-YEAR LOCUST" IS INTERESTING VISITOR

Some of those who are unwillingly entertaining the "17-year locusts" this season, on their first visit since 1902, are not a little puzzled by the mystery of a disappearance that persists for half a human generation, and yet ends with such precision. The fact is that the insect's visible stage is really the final flash of a long career, nearly all of which is spent underground. This summer the female cicadas will lay their eggs on the limbs of trees, and in a few weeks the young will hatch, fall to the ground, and immediately burrow into it. At subterranean depths as great as 20 ft., these larvæ will pass the years, feeding upon roots and gradually changing to the pupa form. In 1936 the fully developed pupas will come out of the ground almost at the spot where the larvæ went in, and from them will emerge the adult, winged cicadas, ready to start another cycle to end in 1953. Another family of cicadas, with a 13-year cycle, is visiting in the South this season.




BY COURTESY OF THE A. L. OF LANE

**The 14-Cylinder "Mercury," at the Left, and the 9-Cylinder "Jupiter," at the Right, Are English Specimens of the Stationary Radial Airplane Engine. Both are Shown in Rear View. Fixed to the "Jupiter" will be Seen the Three Carburetors, Each of Which Feeds Three Cylinders. One Carburetor may Thus Go Bad without Stopping the Engine. In the Lower Center is Shown the "Jupiter's" Back-Cover Unit**

# A SHEEP HERDER'S HOME

By FRANK R. ARNOLD

The Sheep Herder's Traveling Home Has Three Coverings of Canvas, for Warmth; Benches along Both Sides; a Stove Fastened to the Floor at the Front, and a Bedroom in the Back; There Are Also a Washstand and Plenty of Bins and Cupboards for Supplies

JUST at present the sheep herder's lot is a fairly happy one. He gets $100 a month besides his expenses, and one never can see his sheep wagon without wanting to leave civilization for a few months and take to the range. It is the most compact dwelling house on wheels that has ever been devised. For utilizing all possible space it can give lessons even to a dining car or a sailboat. It is dining car and sleeping car in one, and historically forms a permanent link between western pioneer days, when everyone traveled in a prairie schooner, and automobile days when the sheep wagon is used only to follow the herd during the winter and spring, until it disappears up on the high summer range where only a saddle horse can penetrate.



On the Summer Range, High above Wagon-Road Level, the Herder has to Resort to a Tent. On the Tree at the Right Some Herder has Carved His Opinion of the Life

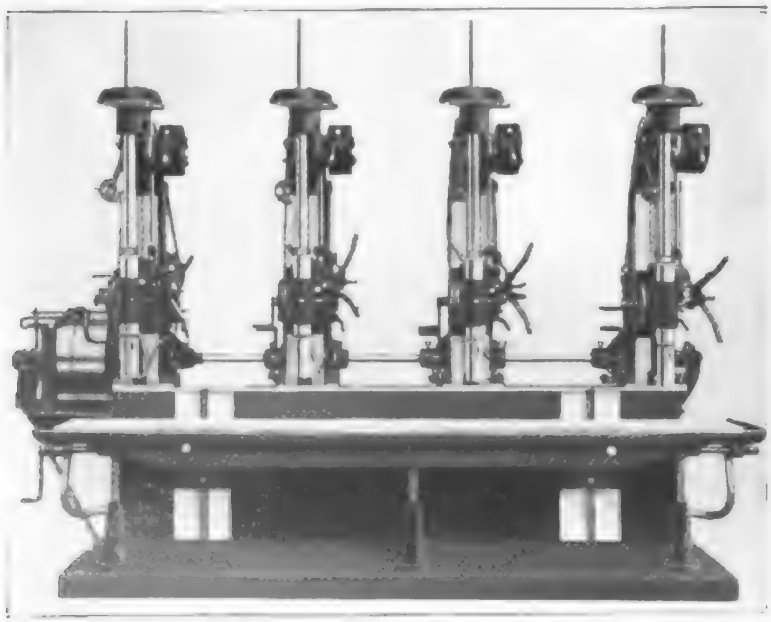
The wagon, which for months is thus the home of two sheep herders, has a long, narrow body, to give freedom to the wheels, but above the wheels it flares out enough to give a broad room with benches along both sides. It has three coverings of canvas for greater warmth in winter, and a stove screwed to the floor near the front door. The back part of the canvas-covered space serves as a bedroom containing nothing but a bed, to which air is supplied by sliding glass windows in the rear end of the wagon. Attached to the bed is a folding table, and under it are small drawers and a large bin to contain the herders' supply of flour and grain. The drawers often have neat little knobs

whittled out from the mountain mahogany, one of the hardest of American woods. Between the wheels under the side benches, the wagon box bulges out into cupboards on either side, to contain oil. One of these cupboards rises up through the bench to make a washstand, with drawers to hold soap, brush, and comb. The canvas room, with openings at both ends, is well ventilated. Six or eight persons can sit on the benches, while one works by the stove, well located by the door. Floor space is as restricted, however, as in a French kitchen, where one can stand and put his hand on anything without taking a step. The sheep herder's kitchen has the advantage that he has also his dining-room table within arm's reach from the stove, and if he lets the table down, he can immediately jump into bed.

On a quaking-asp tree, high up on the Wasatch Range, is cut in the bark the following comment, "Sheep heardin' is hell, Try it." This would seem to indicate some fly in the sheep herder's ointment. A cowboy on seeing the carved inscription remarked, "He must have been a beginner. Most of them, after three months, don't want to do anything else." The speaker was a cattleman, and such have no sympathy with sheepmen.

## NEW SLIDING-HEAD GANG DRILL HAS HIGH SPEED

A new four-spindle, 26-in., sliding-head gang drill has been designed and placed on the market for heavy-duty work. This drill has a lateral adjustment that gives a spindle range from 18 in., between adjacent spindles, to 96 in., between the two outside spindles. It has eight changes of geared speeds and geared feeds on each spindle, independent of each other, and all under instant control of the operator from the front of the drill. A hand-lever reverse is provided, but an automatic reversing mechanism is also available. The machine drills up to 2 in. in steel, and will bore out cast-iron cylinders up to eight inches.



This Four-Spindle Gang Drill Gives a Spindle Range from 18 Inches between Adjacent Spindles to 96 Inches between the Two Outside Ones

## STEEL IMPURITIES REVEALED BY NEW ETCHING PROCESS

A simplified process of discovering impurities in steel, by etching the surface of a section and then taking a "proof" with printer's ink, is announced by an English metallurgist. The steel need not be polished, but is simply finished with emery paper. A solution of 12 parts by weight of copper-ammonium chloride, six of strong hydrochloric acid, and 100 of water, is flowed on the horizontal surface, and kept active by frequent renewal. By starting with a neutral solution and adding the acid later, the copper deposit formed is more readily removed. When the emery marks have been etched away, the surface is inked and an impression taken in a proof press. The resulting "picture" shows the impurities as dark patches or streaks, as the acid more readily eats the purer metal. Indications of the presence of phosphorus are developed with especial clearness.

¶To be used as publicity for the Boy Scouts organization, moving pictures were made of 50 members from Akron, Ohio, on their second annual motor hike, which was taken early in the summer. These pictures will be shown all over the United States.

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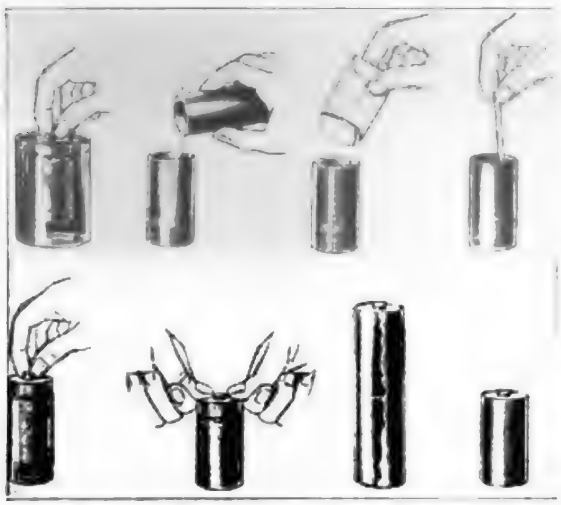
## GERMANS CONSIDERED SODIUM FOR CARRYING CURRENT

Sodium as a conductor for electricity was considered seriously by the Germans during the latter part of the war, due to the scarcity of copper and other metals commonly used for this purpose. On the basis of weight, sodium has three times the conductivity of copper, but because of its low melting point, is difficult to use for carrying electrical currents. To overcome this drawback, the Germans proposed to use it in hollow iron tubes. An almost inexhaustible supply of sodium is declared to exist in the salt beds of Germany.

## MAKE FLASH-LIGHT BATTERIES WHEN THEY ARE NEEDED

With a fresh battery, the popular electric flash light is beyond criticism. Unfortunately, the battery does not stay fresh, deteriorating even if not used. An enterprising manufacturer has taken advantage of this opportunity to put on the market an outfit for making batteries as they are needed. The outfit consists of six empty zinc cells, six carbon electrodes surrounded with depolarizer and surmounted by a cork, and materials for the electrolyte. The fluid is poured into each zinc as it is needed, a powder added, and the mixture stirred. When it congeals, the carbon is inserted and zinc

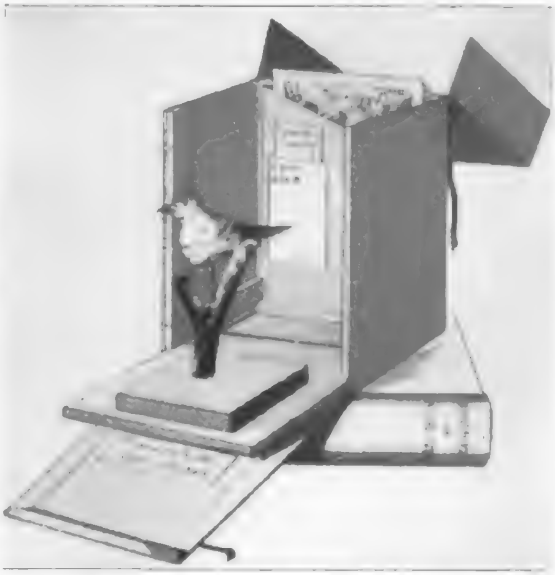


With This Outfit, Anyone can Make Up a New Battery for His Flash Light. The Operations, as Illustrated Above, Are Very Simple, and a Cell That is Not Deteriorated by Storage is Assured

prongs turned down over the cork. The ingredients keep indefinitely. The cells are supplied in standard sizes.

## BOXES FOR STUFFED BIRDS REDUCE BREAKAGE DANGER

Confronted by the problem of distributing several hundred stuffed birds among the schools of an eastern city, the



Danger of Damage to Stuffed Birds and Other Specimens While in Transit is Lessened by This Pasteboard Packing Box

staff of the public library of Newark, N. J., devised a packing box which precludes any reasonable possibility of damage to the specimens in transit. Made in two sizes, the boxes are hinged so that the front may be dropped and the lid raised. A wooden base, on which the stuffed bird is fastened, slides into the box from the front, resting on the bottom, to which it is held by strips.

## ARKANSAS CANNING CLUBS AROUSE MEN'S INTEREST

Men are as actively interested as women in the work of the Arkansas community canning clubs, though these supposedly are women's organizations. At a recent meeting of one of the clubs the men packed string beans, carried water, and operated the steam-pressure canner. As a result, at this demonstration there were put up 60 gal. of beans and 7½ gal. of tomatoes. In the same county the men have built and equipped a house for a steam canner, belonging to another club. Some of these clubs in the Ozarks are miles from a railroad, and the home demonstration agent must needs travel on horseback, fording many streams and covering long distances.

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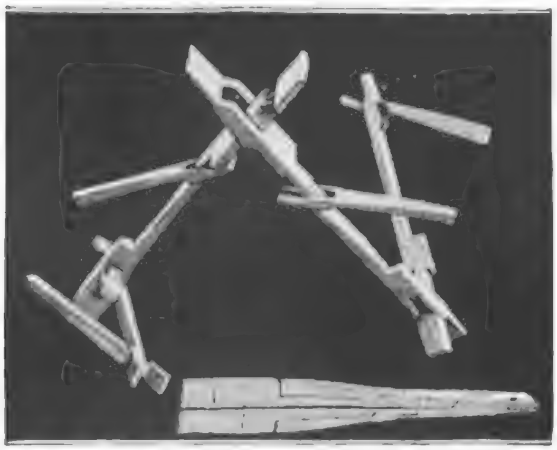
## MULTIPLEX PLIERS SHOW SKILL WITH KNIFE

An interesting exhibit in a western Museum of Wood is furnished by a little article not one-half inch thick and less



This Puzzlelike Specimen of a Wood Whittler's Skill, When Opened Up as Shown, Proves to Consist of Seven Sets of Pliers. Assembled, the Piece of Wood Is About Four Inches Long and One-Half Inch Thick

than four inches long. This piece of wood opens out and discloses seven distinct sets of pliers. These are intended as specimens of skillful whittling, and obviously are not for use.

## PLAN TO PUT COAST GUARD IN THE NAVY

The United States Coast Guard was created in 1915, as a military force, and consists of the former Revenue Cutter Service and the former Life-Saving Service. Congress provided that in time of war the coast guard should be operated by the navy and in time of peace by the Treasury Department. The navy is desirous of adding the coast guard as a permanent branch, which seems the logical department for such work, and inasmuch as something like a million dollars a year can be saved by the transfer, and other advantages be secured, the change seems desirable. As a part of the navy, the young men of the coast guard would find opportunity to graduate into better positions, which at the present time are not available in the Treasury Department.

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¶ Studying the housing problem, the city authorities of Kenosha, Wis., found that there were 500 vacant lots, located on streets with water supply and sewer connections, in that city. Money may be advanced owners of these lots to encourage building.

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OBSERVATION CARS AGAIN FOLLOW ROWING CLASSIC

FOR the first time since 1916 these two observation trains recently bore happy crowds along the four-mile course of the Yale-Harvard race, rowed on the river Thames at New London, Connecticut. Blue for Yale and crimson for Harvard fluttered frantically from trains, river banks, and gay pleasure craft, as the eight from Yale vanquished the Harvard crew in a grueling neck-and-neck struggle. Each university now boasts 26 victories as its share of the 52 annual contests.

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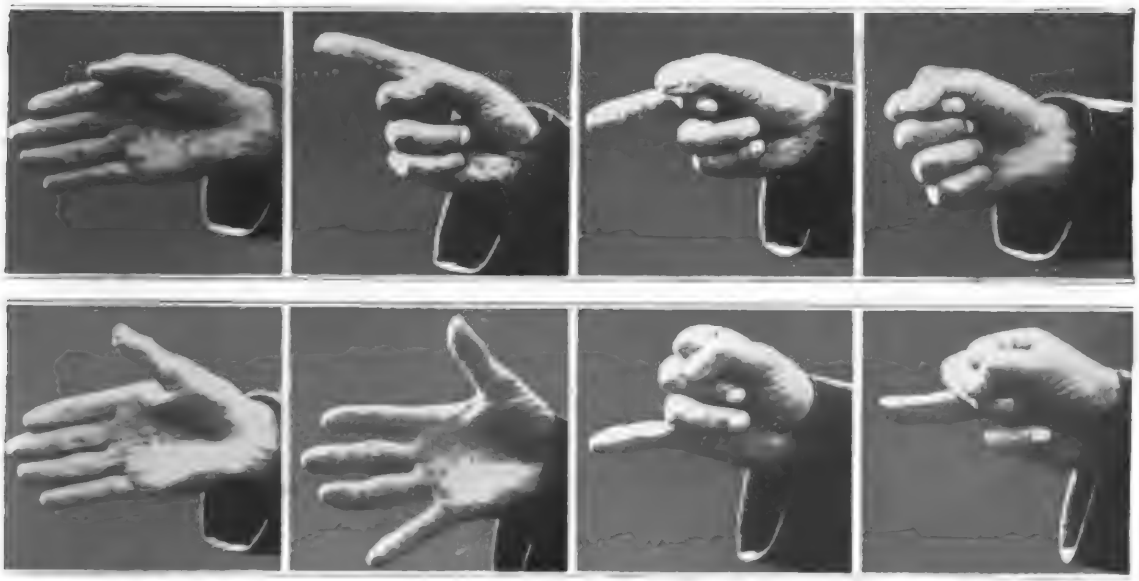

Here Are Eight of the Signals by Which a Big-League Catching Star Communicates His Wishes to the Pitcher. The Pitcher Interprets Them in This Way; Left to Right: Upper Row, Fast Ball, Outcurve, Spit Ball, Waste Ball or Pitch-Out; Lower Row, Another Waste Ball, Slow Ball, Knuckle Ball, Incurve

## BIG-LEAGUE CATCHER REVEALS SECRET FINGER CODE

One of the most important, but inconspicuous, elements of "inside baseball" is the silent finger code by which the catcher communicates with the pitcher. Unluckily, the fans in the grand stand miss it all, since the catcher flashes each signal from behind his mitt, where it can be seen only by his battery mate. The system used by a star in a big-league club is simple and easily memorized. For a fast ball, his right thumb is pressed flush against the forefinger as the palm is exposed to the pitcher. For a spit ball he crooks all but his second finger. For a waste ball or pitch-out he simply clenches his fist. And so on, through the whole list of possible deliveries.

## SIMPLE CHARTS UNTIE HARD MATHEMATICAL KNOTS

Cubes and squares and their roots, logarithms and complex special formulas, to say nothing of multiplication and division, are worked out in a few moments with a recently devised set of charts. To get the answer to any problem, a straightedge, furnished with the set, is simply placed to intersect the two known factors of the problem, and the solution is instantly found at a third point. With 18 charts the whole range of numbers up to 1,000 is covered. Special editions are prepared for chemists and sugar technologists.

## COUNTY BRIDGE DEDICATED TO FALLEN HERO

American communities are looking with increasing favor on the practice of memorializing their soldier dead with useful public improvements. A steel-truss bridge was thus dedicated recently by the citizens of Page County, Ia., to the memory of the first Page County lad to fall in France. In delivering the speech of dedication, the governor of the state paid tribute to the hero's mother, who occupied a position of honor.

This Steel Bridge was Recently Dedicated by the Governor of Iowa to the Memory of a Soldier-Hero Who Died of Wounds Received in France

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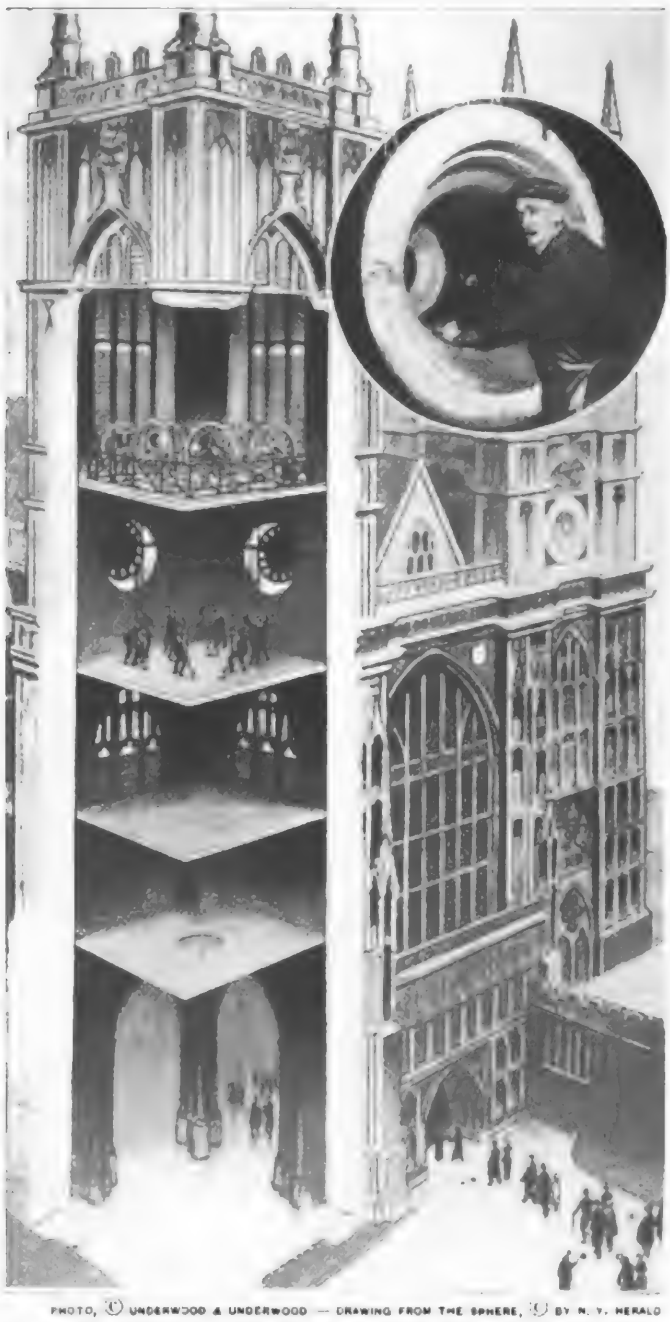
## BELLS OF WESTMINSTER ABBEY READY TO WELCOME PEACE

The old bells that hang in the belfry tower of Westminster Abbey, London, were recently overhauled with a view to their being rung on the signing of peace. To complete the "peal" of eight, it was found necessary to cast three new bells, to recast one of the original set, and to retune the other four. All the work is being done in an ancient English foundry where the intricate science of bell casting has been practiced for 349 years. The extensive experience and skill required for the production of a perfect bell is not generally appreciated. Yet the components must be of the finest quality, must be mixed in careful proportion, and the molten metal must be run into a mold which is designed by an expert craftsman. On being removed from the mold, and after having thoroughly cooled, which, by the way, sometimes takes several weeks, the bell should produce a perfect tone with very little tuning. When correctly struck, it should give out three distinct notes: a "fundamental," the octave above or "nominal," and the octave below or "hum note." Only the most delicate proportioning of material and design will produce a bell in which all three notes are true.



PHOTO, © UNDERWOOD & UNDERWOOD — DRAWING FROM THE SPHERE, © BY N. Y. HERALD

**The King and Queen of England Christened These Eight Victory Bells Which Now Hang in the Northwest Tower of Westminster Abbey. The Insert Pictures a Workman as He Chisels the Inscription on One of the Bells**

## TWENTY THOUSAND TRUCKS TO BE GIVEN STATES

Twenty thousand trucks, found useless to the War Department, are to be given away by the secretary of agriculture to the highway departments of the various states, which have only to pay loading and freight charges to acquire the machines. The value of the trucks is over $45,000,000. Of the total number, 11,000 are new and 9,000 have been used. All are in serviceable condition. The capacity of the trucks ranges from two to five tons each. Under the law which authorizes the distribution of the trucks, the states to which they are given must use them in the construction of roads for which Federal aid is given. An appropriation of $2,000,000 was made recently for this purpose. None of the trucks may be given to counties or individuals.

¶The first commercial flight between the United States and Cuba was made recently by a seaplane. The 381 miles from St. Petersburg, Fla., to Havana were flown in five hours 20 minutes.

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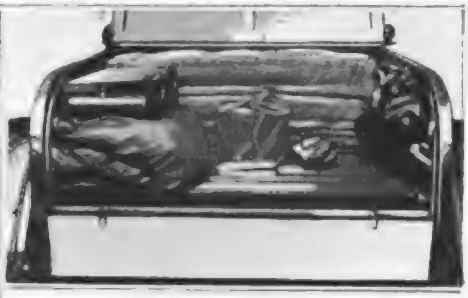
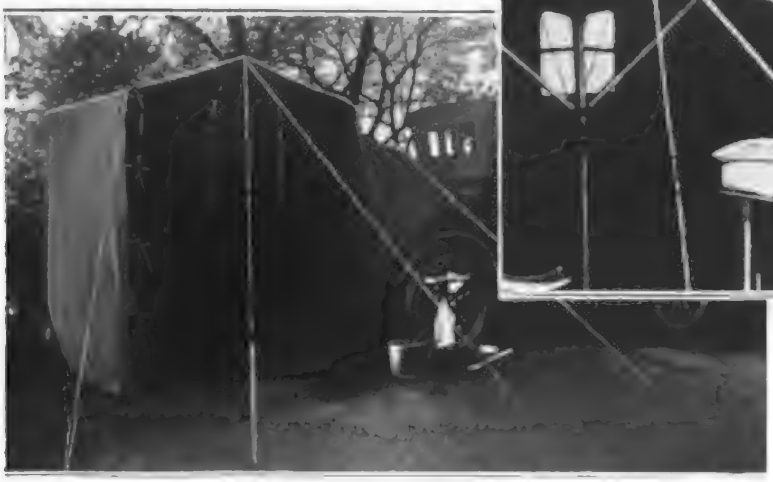
There Is Nothing about the Automobile in the Picture Above to Hint That It Carries a Complete Camping Outfit, but That Is the Case, and It Is Very Complete



Packed Away, the Camping Outfit is Shown Above. There Is Room for Food and Clothing in the Same Compartment



To the Left Is a View of the Tent, Attached to the Rear of the Automobile While, Above, a Peep into the Shelter may be Had Revealing the Convenient Arrangement of Its Interior

## COMPLETE CAMPING OUTFIT HIDDEN IN AUTO BODY

In appearance nothing more than part of the body of a certain common type of small automobile, a new attachment conceals a complete camping outfit, including a tent, spring mattress, gasoline stove, table, two camp stools, chair, washstand, lantern, ax, aluminum cooking outfit, and water bucket. An advantage of this arrangement, the makers say, is that one may go camping without announcing the fact by the unusual appearance of one's automobile. Less than five minutes is required to set up the outfit. A bed is formed by attaching the table to the rear of the automobile and placing the mattress on the platform thus formed. Room is provided for carrying food and clothing in the same compartment which holds the outfit. The attachment is recommended by the manufacturers for week-end camping trips, though the equipment is sufficient for considerably longer stays in places out of the beaten path.

## STAIRLIKE CURRENCY TRAY USES SMALL DESK SPACE

For the conservation of desk space a folding currency tray has been devised by a western man. It consists of a series of wooden boxes, held together by strips of metal which allow them to extend in the form of a stairway. A support extends from the back of the top tray to a level with the bottom of the lowest tray. The increased circulation of paper currency was one reason for devising the tray.

This Tray was Devised for the More Convenient Handling of Paper Currency

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## GOCART USED TO DELIVER BOOKS IN HOSPITALS

The sick soldiers now reach out from their couches in the army hospitals in and near Chicago and select books and magazines from a little gocart delivery machine that is used by representatives of the American Library Association. It is a light affair with rubber-tire wheels, which make it noiseless and easy to handle. The convalescents call the service "books à la carte."

PHOTO BY SGT. GUY M. SCOTT

**Books are Served to Sick and Convalescent Soldiers in Hospitals of the Chicago District, from "Tea Wagons" Built for Literary Instead of Culinary Purposes. They Are Easy-Running and Silent**

## NEW CABLE TO SOUTH AMERICA WILL FORM DIRECT LINK

A new cable line, 3,200 miles long, forming a direct connection between North and South America, is a project whose completion within the next few months is confidently expected. The island of Barbados, at the eastern edge of the West Indies, is the connecting link in the plan, the proposed route running from that point to Belem, Brazil, where it will connect with the British telegraph network in South America; and to Miami, Fla., joining there the great wire system of the United States. The British and American companies each will lay about half of the new cable, Barbados being near the center of the route.

## TRY CONCRETE FREIGHT CAR WITH DRASTIC TESTS

If the most severe uses of railroading could break it down, the concrete gondola car described in Popular Mechanics Magazine last May would have been put out of service before this. In the Chicago yards it was given unusually rough treatment, but the only result of its fast flying switches was to smash the ends of other cars. After serving in the Illinois coal fields, it returned to Chicago with a load of coal, and was unloaded with a clamshell scoop. Inspection failed to reveal the slightest indication of defect, no signs of crack or chip being found. The car has now gone to Pennsylvania with 45 tons of steel rails, and there will handle steel products until it either gives up or proves itself indestructible.

## BEET GROWERS USE NET UNLOADING CROP

Sugar-beet growers are now employing a strange method of saving time and labor in transporting the crop from the field to the sugar mill. A large net is placed over the body of the wagon rack, and after the load is on, the net is closed and tied in the center. Upon reaching the mill a crane lifts the entire load off at one operation, and transports it to the crushing machines.

**The Net Which Incloses the Sides of the Wagon Contains the Whole Load of Sugar Beets, and Enables Them to be Removed by a Crane in One Operation, Saving a Great Deal of Labor**

Spraying Concrete Pavement with a Solution of Creosote and Mineral Dye of a Deep-Green Hue Dispels the Disagreeable Glare in Bright Sunlight, and Substitutes a Restful and Soothing Effect. The System is Used with Success by an Eastern Amusement Park

## CONCRETE WALKS SPRAYED TO OVERCOME GLARE

After much study and experimentation, an eastern amusement company has succeeded in taking the glare out of its concrete walks. This was done by applying a solution of mineral dye and creosote. At first a spraying process was used, but owing to the solution being found non-injurious to the workers, it was later applied with large brushes. The effect is very pleasing, as the dye gives the concrete a rich deep-green color, which is restful to the eyes and harmonizes with the surrounding trees.

## FILIPINO GIRLS SUCCEED AS BUS CONDUCTORS

Uniformed Filipino girls have given excellent satisfaction as conductors on motor busses in Manila, and have proved again the truth that woman's place is not necessarily in the home. The inability of the street cars to handle traffic in the island city made it necessary to start the bus line. At present there are 13 machines, but plans have been made to increase the number to 50. Thirty passengers are carried in the busses now in use, but the new ones will carry 60 persons. The directors of the auto-bus company declare themselves thoroughly satisfied with the ability of the native girls.

## HUMANE ANIMAL MUZZLE OPERATED BY GRAVITY

The secret of a recently introduced humane muzzle, which allows the animal wearing it perfect freedom of the jaws

As Long as the Animal Wearing This Muzzle Keeps Its Nose toward the Ground, the Gravity-Operated Catch will Allow the Jaws to be Opened. When the Head is Raised, the Contrivance Restrains

when the head is in a lowered position, but which restrains when the head is raised, lies in a gravity-operated catch. This catch holds a rubber-covered metal bar firmly under the lower jaw when the animal's nose is not pointed earthward, but is disengaged by the force of gravity when the nose is lowered. Springs come into action when the catch releases the bar, holding it gently against the jaw,

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and the animal may eat from the ground with ease. The muzzle may be used as a curb for vicious dogs or for weaning calves and colts.

## AIR MAIL PLANNED FOR TOWNS IN CANADIAN ROCKIES

Few portions of the earth's surface seem to promise less for the development of commercial aviation than mountain-strewn British Columbia. Yet a Vancouver newspaper has joined with an aerial association of the city in promoting a flight across the Rockies and back, in order to demonstrate the feasibility of an airplane mail service to the isolated mountain towns. Details of the trip are being worked out as the promoters await the arrival of a long-distance bombing plane from England. Starting at Vancouver, the flight will be made over a triangular course, the first leg extending 400 miles eastward to Calgary, Alberta, the second north to Edmonton, a distance of 200 miles, and the third to Vancouver again.

This Group of American Aviation Mechanics Built the Whose Plans have been Followed

## BALANCED ROCK IS CONCRETED TO SAVE SCENIC FEATURE

Repairing scenery with concrete is an unusual aid to nature, but it was found necessary at Castle Ford, Idaho, where a remarkable specimen of balanced rock seemed in danger of losing its balance. The rock, on a mountain crest a short distance from town, is about 30 ft. high and 25 ft. across at the top, its vast weight supported on a stem only 3 ft. or so in diameter. Despite this extraordinary top-heaviness, which contributes a novel scenic effect attractive to great numbers of tourists, the rock's center of gravity has been calculated to lie well within its narrow pedestal. With its new concrete reinforcement the curious pillar, whose top bears the huge likeness of a human face, will probably stand for all time.

¶ Famous now as a health resort, Bath, England, may become famous also as an important city in the glass-coloring industry. Since it was discovered that glass may be permanently tinted by immersion in the hot mineral waters of Bath, experiments have been made with the idea of developing a stained-glass industry there.

By Repairing with Concrete the Thin Neck of a Huge Balanced Rock, as Seen at the Left the People of an Idaho Town Were Able to Preserve a Remarkable Scenic Feature, the Distant Profile of Which is Pictured at the Right

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Caproni Biplane While Stationed at Milan, Italy. The Civilian in the Center, Gianni Caproni, Is the Designer by the United States Government in the Construction of Many Other Big Bombing Planes

## AMERICAN WORKMEN BUILD BIG CAPRONI BIPLANE

In addition to the routine repair work, the American aviation mechanics at Milan, Italy, were able to do some actual construction. A number are shown in the illustration grouped before the first Caproni airplane to be built by American workmen. The picture is of double interest, as the group includes Gianni Caproni, known to the profession as the "Apostle of Big Planes."

## BASE OF ANCIENT TREE SERVES AS WELL CURB

The hollow base of an enormous buttonwood tree, believed to have been planted by the Indians as a boundary mark 250 years before it was felled, is now serving as a well curb in a Rhode Island town, near where it grew. A roof for the curb is made of other parts of the tree. On the side next to a highway which runs alongside the property of the owner of the well, a sign inviting travelers to stop and quench their thirst has been painted. At the top the curb is 54 in. in diameter and 72 in. at the base. Inside the unusual curb is the pump.

What Remains of a Buttonwood Tree Two and One-Half Centuries Old Is Now Serving As a Well Curb in a Rhode Islander's Yard

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## REFRIGERATING PLANT ADDED TO EQUIPMENT OF HOTHOUSE

Of all the blueberry plants he carefully tended in his warm greenhouse during the winter, a botanist found only one in blossom in the spring. And that one survived because it had wisely pushed its way through a hole in the glass roof toward the invigorating severity of the outside temperature. As a result of his discovery, the scientist has installed a refrigerating plant in his greenhouse where he now "winters" his plants at his discretion, thus conducting his experiments regardless of the season.

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**This Hothouse Is Remarkable for Its Refrigerating Plant Which Enables the Botanist to "Winter" His Plants at His Discretion. The Scientist has Found a Variety of Shrubs Which will Blossom Only after Treatment of This Sort**

## PLAN UNITED STATES MAP MADE FROM PHOTOGRAPHS

Every square inch of the surface of the United States will be photographed from aeroplanes in the preparation of a topographical map of the country which is being planned. The photographs will be pieced together and the mosaic will show every detail. This sort of a map is considered necessary by aviators before full use of the aeroplane will be possible. No map in existence takes in all that the proposed photographic map would show.

¶An enormous gas cloud gathering on the sun forms an arc 340,000 miles long on the edge of that body, astronomers say. It is about 125,000 miles away from the edge, and the distance from the sun to the top of the cloud is estimated to be 200,000 miles.

## ONE-LEGGED SPORTSMAN CONTINUES HIS PLAY

Although he found it impossible to wear an artificial limb, an English sportsman who lost his right leg a short distance below the hip joint, was able to lead an active life, aided by crutches. Within a year after his leg was removed, he was able to swim and ride a horse. Later he took up shooting, and eventually played golf, drove a motor car, and rode a bicycle. On the latter he has ridden as far as 30 miles in one day. A three-speed gear enables him to climb hills, while a special pedal, on which two straps bind his foot, permits him to apply power during the upstroke as well as the downstroke of the pedal. Mounting the bicycle is the most difficult for the one-legged man. He accomplishes this by locking the front wheel with a brake, balancing himself in the saddle by means of a crutch on his right side, and pushing with the crutch and the pedal at the same moment.

## ARTIST PAINTS PICTURES ON AUTOMOBILE

An Oregon motor owner, who is also an artist, has decorated his car in a novel manner. On one side he has painted the picture of Crater Lake, a national wonder, while on the other side he has depicted Ashland Creek. The auto being new, the panels presented a splendid surface for the pictures, and excellent results were secured.

**Touring Car that Carries Its Scenery with It, in Panels Painted on Its Sides by the Owner**

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The Tangled Mass of Iron Above Was Modern Machinery before the Blast, While at the Right is Seen All That Remained of the Starch Plant, with Fire Completing the Destruction

## EXPLOSION IN STARCH PLANT BRINGS DEATH AND RUIN

An explosion of extraordinary violence and destructiveness recently wrecked a starch factory at Cedar Rapids, Iowa. The demolition was so complete that the cause could not be determined with any certainty, opinion being divided between ignited mill dust and an overheated boiler. Few of the 150 workmen engaged at the time of the accident in night work at the plant escaped injury or death, the list of those killed reaching 20 or more. Water mains in the vicinity were broken by the blast; windows were smashed throughout the central portion of the city, which has a population of 33,000; and a mile away persons were thrown from their chairs, while the fronts of several buildings were shattered. Places 30 miles distant reported hearing the detonation.

## SIXTEEN THOUSAND ROSES USED IN DISPLAY

Seldom are flowers used as lavishly as they were by a musical-instrument dealer in an Oregon city during a recent rose carnival. A window display required 16,000 pink roses, which completely covered a grand piano and a piano bench. At the instrument in the midst of the floral profusion was seated a wax figure, representing a child playing.

In One of the Famous Rose Carnivals of a Pacific Coast City, a Single Window Display, Made by a Music Dealer, Fairly Out-Flowered the Carnival by Covering a Grand Piano and Its Bench with 16,000 Pink Roses. The Wax Figure Seated at the Instrument Represents a Child Performer

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## CAFETERIA SYSTEM LETS PIGS SELECT THEIR OWN MENU

Discovery that small pigs are competent to select the menu best suited for them is being put to good use by Corn Belt farmers. Pig cafeterias, consisting of little houses with feed hoppers supplied with corn, meat, meal, wheat by-products, salt, and other delicacies, multiply the weight of the young porkers, until, before their first birthday, they are sold at a good price. A bar fence keeps the big pigs out of the cafeteria.

This Is a Cafeteria, Whose Patrons are Taking a Nap in the Foreground. Feed Hoppers Containing Various Nutritious Substances Enable the Little Pigs to Select Their Own Food

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¶ War posters of every nation involved in the war were exhibited recently in the public library in New York. The exhibits included not only those of countries associated with the United States in the fighting, but also those of the enemy countries.

## CAGE LOCK CANNOT BE PICKED WHEN NEW DEVICE IS USED

Persons skilled in criminal craft usually find little difficulty in picking the locks of bank and cashier cages by threading wire or string around the latch. A Chicago inventor has prevented further tampering of this kind by surrounding the latch with a rectangular casing projecting from the edge of the door, which fits into a corresponding recess in the latch-keeper case on the jamb. This interposes a positive barrier against any attempts to get at the latch when the door is locked. For all doors that slide instead of swinging on hinges, this form of lock should be an excellent protection.

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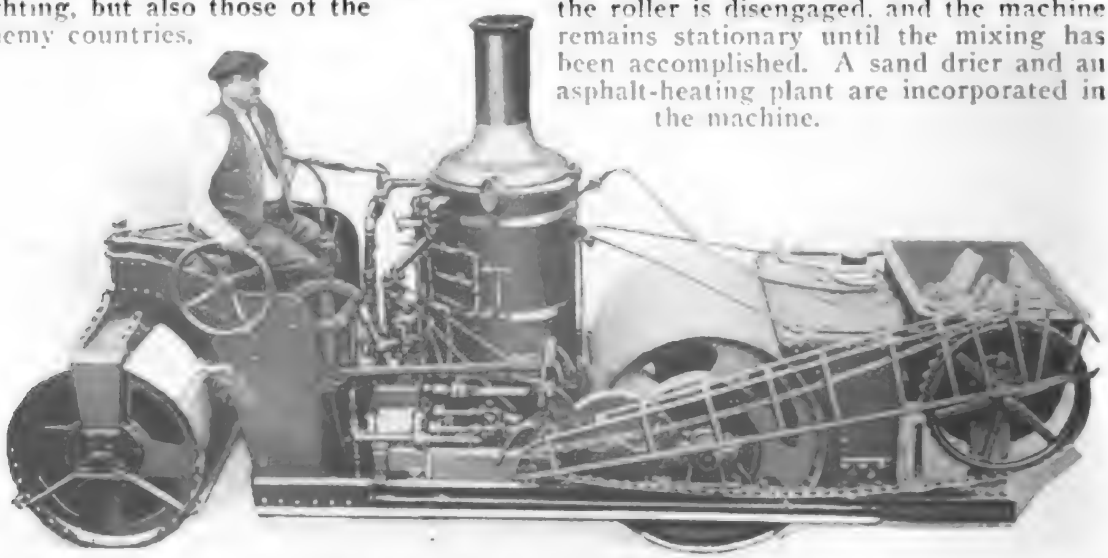
## MIXER ATTACHED TO ROLLER AIDS STREET REPAIRERS

A mixer for asphalt or concrete is carried as a component part of a street roller used by a Pennsylvania city and has proved to be a great timesaver for street-department employes. Attached forward of the water tank, the mixer is driven by a sprocket chain from a sliding gear on the crankshaft of the engine. When the mixer is in operation, the gear driving the roller is disengaged, and the machine remains stationary until the mixing has been accomplished. A sand drier and an asphalt-heating plant are incorporated in the machine.



Two Machines Usually are Required to Mix and Roll Asphalt or Concrete, but This Machine will Perform Both Operations. It is Used by the Street Department of a Pennsylvania City

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## CONCRETE HANGARS FIREPROOF IN EVERY DETAIL

Should an airplane catch fire in one of the government's new-type, fireproof hangars, the building could be so tightly sealed that the fire would virtually be smothered. The material used is chiefly concrete and steel, with a roof of tile, wire-glass windows hung in metal frames, and steel doors of the roller type which are opened and closed with power from an electric motor. The airtight feature is supplied by a system of ventilating windows which may all be closed instantly by throwing a single lever. In addition to reducing fire risk, such well-built hangars will serve until air planes go out of fashion or change radically in construction.

This Government Hangar Is of Concrete and Steel, a New Type Which Costs about $35,000. They Are Worth the Price, as They will Last for Years, and Are the Last Word in Fireproof Construction

## DANGER IN CASSEROLES FOUND BY WOMAN

Poison may lurk in the glazed casserole, used so generally for baking, if tests made by a woman scientist are to be relied upon. Lead used by the manufacturers of these vessels for glazing may be extracted, the experimenter found, by the use of acids and heat. Her conclusion is that foods containing acid juices or vinegar should not be cooked in a casserole, unless it is known certainly that the glazing contains no lead. Boiling a one-per-cent solution of citric acid in a casserole for 30 minutes extracted, in several cases, from .03 to .06 gr. of lead monoxide for every 15.5 sq. in. of surface. Even after 10 or 12 boilings, lead was extracted, though the quantity grew less as the tests grew in number. Water containing more than .01 gr. of lead per gallon, or, in other words, one part of lead to 7,000,000 of water, is considered unsafe for drinking purposes.

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¶The baobab tree of Africa yields a fiber which has been pronounced by Scotch experts to be the finest paper-making material to be found, and very flexible in the results it accomplishes.

## SHELLS SHOW GAS RECORDS AS WAR ENDED

A clever device prepared by the chemical-warfare service visualizes the mustard-gas production of the various powers at the time of the signing of the armistice. Giant shells were used to represent the American, British, French, and German gas-making records. These shells formed part of the chemical-warfare display of 18 floats in a recent parade, and showed more "action" than any other unit participating in the event.

Float Entered in a Recent Parade by the Chemical-Warfare Service, Depicting the Relative Production of Mustard Gas by the Great Powers

Other floats carried airplanes, a captive balloon, and army ordnance.

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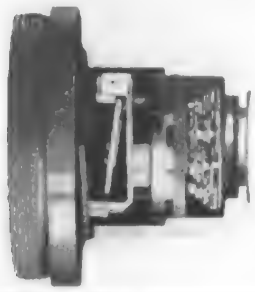
## NEW DRIVING METHOD USED FOR HUB ODOMETER

An entirely new method of driving a hub odometer for automobiles is used in an improved type of this mechanism now being sold. In the old type it was necessary to have made in the axle, or in the nut on the end of the axle, a hole or slot in which the operating lever of the odometer was fitted. None but the simplest tools are required for the proper adjustment of this new odometer, the operating lever of which is pressed into one of the slots of an ordinary castellated nut on the end of the axle by a stiff spring. Nearly all automobile axles are equipped with such nuts, or may be so equipped at any garage. An unusual feature of the recording mechanism of this odometer is that it has no spiral spring in its make-up.

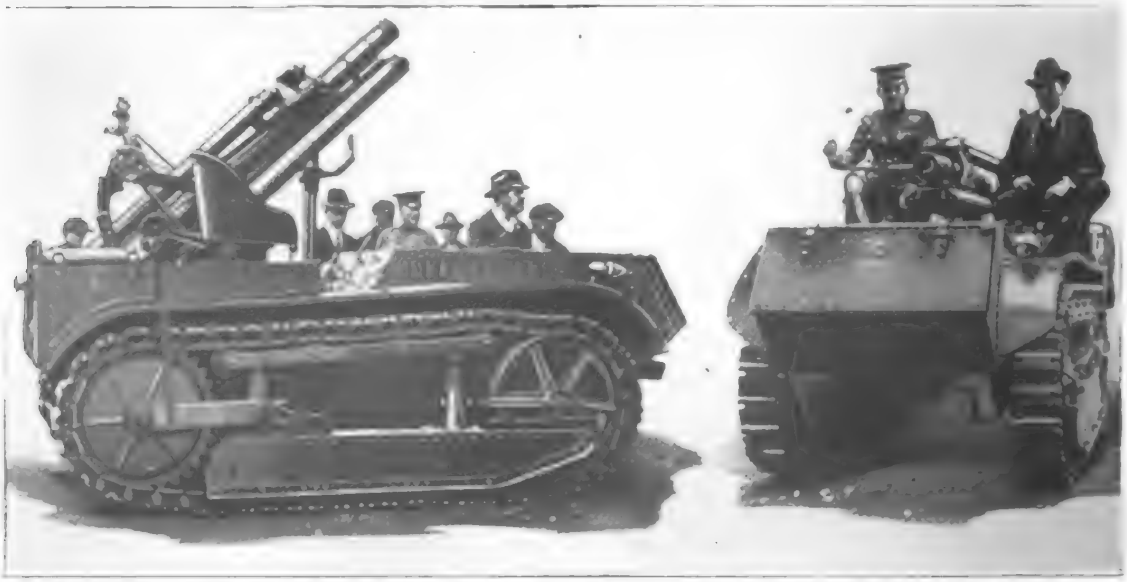


## MANY USES FOR AIRSHIPS SEEN BY AUTHORITY

Dirigibles may be used to advantage by every department of the government, according to a high War Department official, who urges the establishment of army airship bases throughout this country and the colonial possessions of the United States. Some of the uses to which the ships could be put, says this authority, are chasing criminals, guarding borders, making crop surveys, cruising timber areas, warring on destructive insects, especially the locust, and delivering mail in regions where any other sort of transportation is difficult. He believes the dirigibles could be operated at comparatively small cost, considering their value in work of this kind.

## ARTILLERY EVOLUTION CAPPED BY TRACTOR-MOUNTED "75"

As army experts report on the performance of the 75-mm. gun's new tractor mount which climbs hills like a tank, and speeds along the level at 15 to 20 miles an hour, it is interesting to recall the mounting of the very first cannon. The first crude guns were laid flat on the ground between two timber supports, the breech resting against a wooden post which absorbed the recoil. To batter down a castle, the guns were "planted" a hundred paces from the wall and fired until the walls fell down or the guns blew up. Later, about 1450, the familiar wooden, horse-drawn carriage appeared, satisfying all requirements until these days of scientific, high-speed warfare typified by this combination of the peerless "75" with the endless-tread tractor, resulting in an extremely mobile and effective arm.



Making a Few Alterations in a Stock Model, a Manufacturer of a Well-Known Endless-Tread Tractor has Produced a Very Satisfactory Mounting for the Americanized 75-MM. Fieldpiece. Its Extreme Mobility and High Angle of Fire Make the Combination Valuable in Repelling Attacks by Hostile Air Craft. Seats are Provided for Three Gunners in Addition to the Driver

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**The Crews of the Three Transatlantic Seaplanes were Welcomed in True American Style on Their Arrival in Paddington Station, London. A Howling, Self-Appointed Committee of American Sailors and Soldiers Rushed the Cars, and in a Twinkling Had Lieutenant Commander Read, of the "NC-4," on Their Shoulders. He was Borne in Triumph up and down the Station Platform**

# AMERICA'S TRANSATLANTIC SEAPLANE VISITS ENGLAND

By PAUL A. JENKINS

THE arrival of the seaplane "NC-4" in the harbor of Lisbon, Portugal, completing the unprecedented flight of 2,150 miles across the Atlantic Ocean—this was really the climax of our navy's gigantic experiment in transoceanic airplane flight. But it was felt by officials in Washington, by the crew of the "NC-4," and by the American public, that the journey should rightfully be continued to England, if for nothing else than to strengthen the ties of friendship which unite the two nations.

So, in the early morning of May 30, after a pleasant sojourn of three days among the hospitable Portuguese, the "NC-4" slipped from Lisbon harbor and headed north. Familiar now with every inch of their well-tried ship, the crew felt confident of reaching Plymouth and a royal welcome that same evening. But when only 100 miles from Lisbon, the port engine developed a slight leak, necessitating a halt on the Mondego River. Repairs were made in short order, and at 1:38 in the afternoon the "NC-4" pointed her nose northward once more. As the plane zigzagged to escape rain squalls, the 220 miles to the northwest tip of Spain sped by, and at 4:47 p. m. a landing was made in Ferrol Harbor. The delay at Mondego was short, yet enough to make impossible the completion of the trip that day.

But at 6:27 on the morning of May 31, having been on the way 23 days, the "NC-4" rose for the last effort which should carry it across the Bay of Biscay and over the English Channel. The flight was made with ease, despite heavy rain and an almost continuous blanket of fog which hid all but two of the route-marking destroyers. At 1:12 p. m., the crowded water front of Plymouth became visible through the shrouding mist, and at 1:26 the "NC-4" touched water in the harbor that witnessed the sailing of the Pilgrim Fathers 300 years ago. Thereafter followed days replete with banquets and receptions.

But back in Washington, D. C., these days were spent in study and conference by the silent men who planned the magnificent venture. From the logs of the foundered "NC-1," the dismantled "NC-3," and the triumphant "NC-4" were drawn the lessons taught by success and failure.

They first found that the "NC-4" had flown, through an atmosphere often thick with fog and rain, a distance of 3,925 nautical miles in 55 hours and 33 minutes, or at a speed of 70.1 miles an hour. They were gratified by the proved seaworthiness of the hulls, and by the unshakable sturdiness of struts, spars, and the other elements of the flying surfaces. Those who



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The Seaplane "NC-4" is Pictured beside the U. S. S. "Shawmut" in Lisbon Harbor on the Completion of the First Transatlantic Flight. The Romance of the Exploit was Nowhere More Appreciated Than in Lisbon Itself. Ships Were Gay with Bunting; Homes, Shops, and Cafés were Emptied as Bulletins Proclaimed the Steady Progress of the "NC-4" from Ponta Delgada

After a Brief Rest aboard the U. S. S. "Aroostook" the Triumphant Crew of the "NC-4" were Conveyed to the Barbican, Plymouth's Ancient Stone Pier. Here They Passed between Ranks of British Bluejackets to the Mayor of Plymouth, Dressed in Robes of State, Who Welcomed Them and Later Stood with Them to be Photographed on the Mayflower Stone



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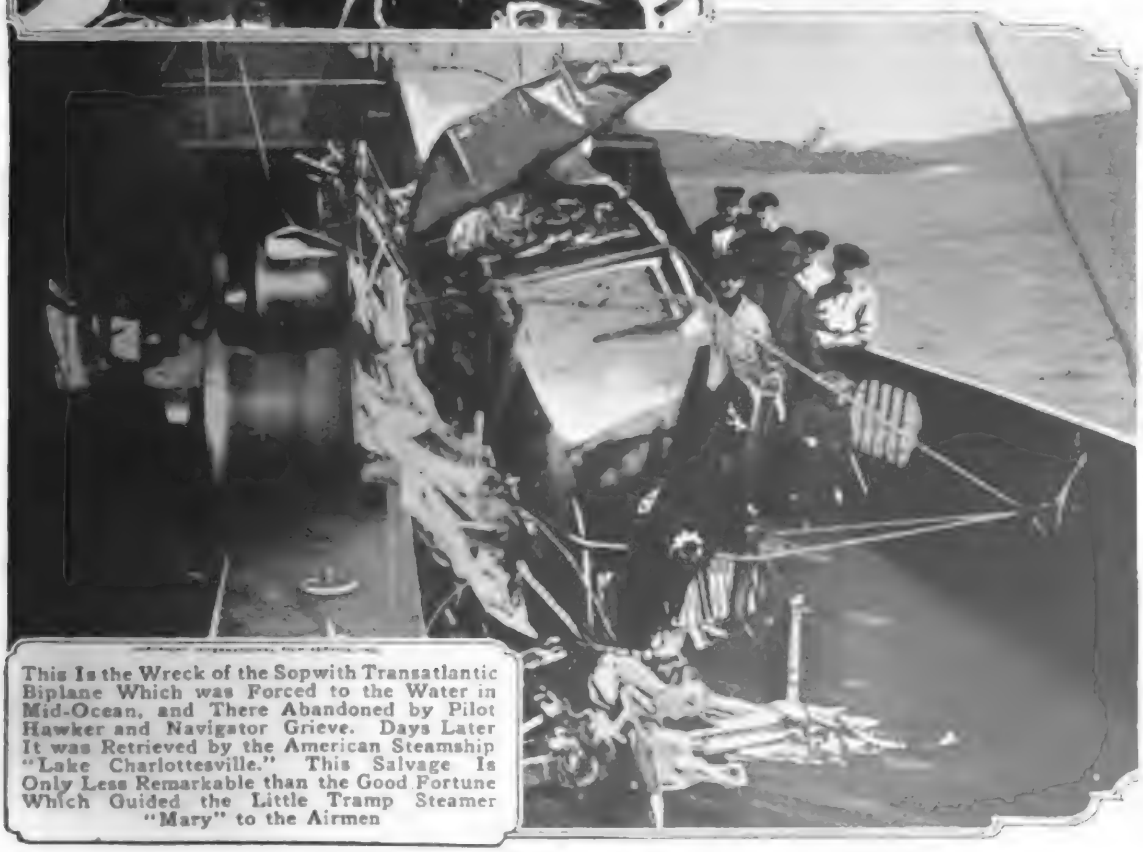
The Battered "NC-3" is Seen in the Harbor of Ponta Delgada after Its Long Beating by Wind and Wave. Inspection will Show, How the Crew were Forced to Slash the Lower Wings to Relieve the Structure of the Water's Crushing Weight

The People of Britain Welcomed Hawker and Grieve with an Enthusiasm Which has Never been Surpassed. Rejoicing was Centered in London, Where Cheering Crowds Jammed the Route from the Station to the Aero Club. Hawker is Pictured Making Slow Headway on a London Policeman's Horse



This Is the Wreck of the Sopwith Transatlantic Biplane Which was Forced to the Water in Mid-Ocean, and There Abandoned by Pilot Hawker and Navigator Grieve. Days Later It was Retrieved by the American Steamship "Lake Charlottesville." This Salvage Is Only Less Remarkable than the Good Fortune Which Guided the Little Tramp Steamer "Mary" to the Airmen



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sponsored the installation of the once-criticized Liberty engines were jubilant as they learned that, of the four which brought the "NC-4" into Plymouth Harbor, three had started from Rockaway Beach. Much to praise was seen, also, in the carefully planned patrol system which strung destroyers across the ocean wastes like beads on a string.

But the lessons of most value were taught by failures and shortcomings. The navigating instruments did good work, yet their inexactness in fog and storm caused the misfortunes of the "NC-1" and the "NC-3" at the Azores. Wing-tip pontoons proved unsubstantial, the "NC-3" suffering especially from this weakness. It was learned, too, that the continuous effort required of the pilots during their watches at the wheels were fatiguing to the danger point. Automatic electric controls were suggested as a means of lightening their task in the future. These and a few other defects were found; but they were matters of detail, dwarfed by the essential worth of hulls, planes, and motors, proved in the most grueling test ever applied to any airplane.

In completing this first chapter in the history of transatlantic air travel, mention must be made of Harry G. Hawker. As he traveled from the north of Scotland, where he was landed by a British destroyer, he was cheered by enthusiastic crowds at every station. In London he was made the hero of a reception which has never been equaled for any general or sovereign. On May 27 the tattered remains of his Sopwith biplane were picked up in mid-ocean by an American steamship. On June 1 he was one of the first to welcome the crews of the American seaplanes as they stepped from the train at Paddington Station, London.

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## BUNGALOW IN HEART OF CITY AIDS HOUSING MOVEMENT

A model bungalow, recently completed in the down-town district of Portland, Ore., to stimulate interest in providing good homes for workers in local shipyards, is not to be abandoned under the changed conditions following the war. Instead of serving as a headquarters for a special housing committee, however, in it is located the offices of the "own your own home" movement, organized by officials and business men. A soldier and his bride were married in the bungalow as part of the house warming.

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¶A special meteorological station to detect and give warning of the approach of tropical storms has been established on the west coast of Florida by the Weather Bureau. These storms develop between the months of June and November.

**Bungalow in the Down-Town District of Portland, Oregon, Now Used as Offices for an "Own Your Own Home" Movement: It was Originally Intended as Headquarters for a Special Committee on Better Housing for Shipyard Workers**

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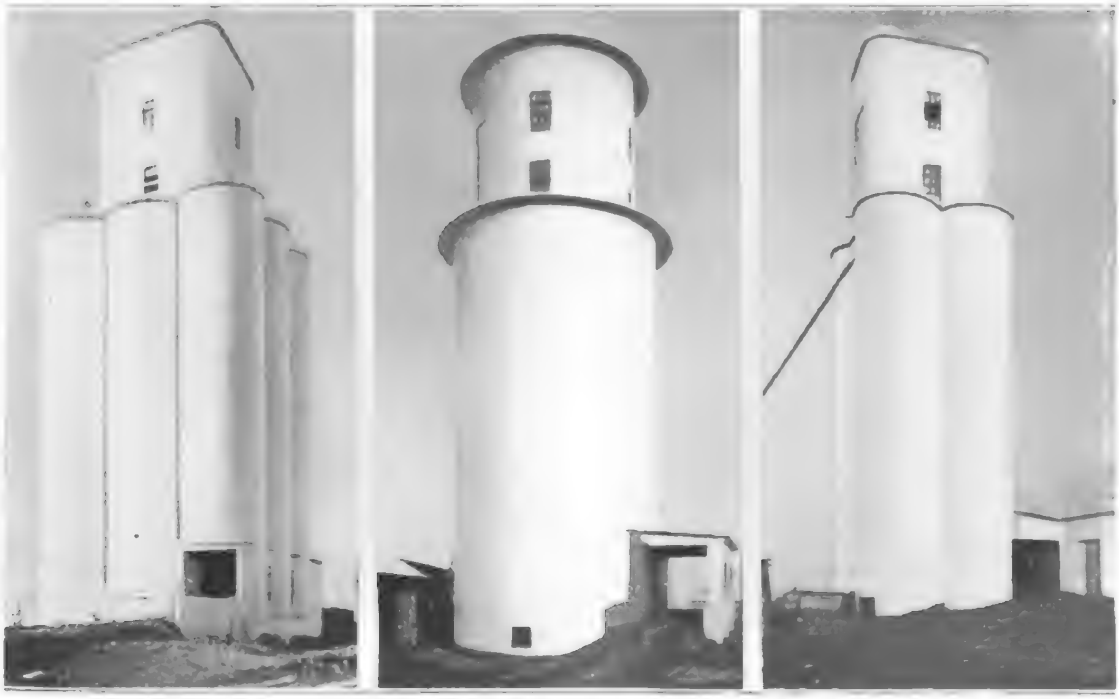

Three Examples of the Reinforced-Concrete Grain-Elevator Construction Adopted by Farmers' Associations in the Central States: These Are in Illinois, and Have Capacities of 65,000, 35,000, and 30,000 Bushels Respectively, Costing Upward of $10,000 Apiece

## FARMERS' ASSOCIATIONS BUILD CONCRETE GRAIN ELEVATORS

Concrete grain elevators of the most modern construction, and not without artistic merit, are being erected throughout the central states by coöperative associations of farmers. State organizations in Ohio, Indiana, Michigan, Illinois, Iowa, Minnesota, Nebraska, the Dakotas, Kansas, Oklahoma, and Colorado are pushing the new work as fast as possible, erecting structures ranging in cost from $10,000 up, and averaging $20,000. The elevators are located on railroads at grain-growing centers, saving hauling costs, assuring each producer market prices for his grain, and supplying flour, bran, and feed at minimum rates. The cost of insurance is also saved. With the movement growing rapidly, new associations constantly organizing, and a total of 3,000 elevators already in use, there is reason to believe that the notable economies effected will begin soon to react to the benefit of the consumer, in lower prices for corn-fed pork as well as wheat bread.

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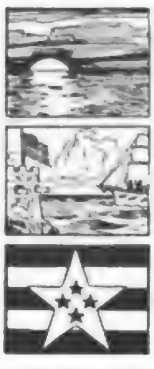
¶ To have charge of the selling of government-owned wood, concrete, and steel yards, and other plants, a new department has been created, to be known as the Plant Disposal Section. It will function under the Emergency Fleet Corporation.

## TEACH NATIONAL ANTHEM BY USE OF PICTURES

Teaching the national anthem by means of pictures supplementing the words, is the idea of a Philadelphia man. He has caused to be printed a pamphlet, on four pages of which are the words of "The Star-Spangled Banner," one verse to each page. Beside each line is a picture visualizing the idea expressed by the words. These pictures are printed in red ink, which gives a patriotic color scheme, as the words are in blue and the paper of the pamphlet is white.

### First (or Dawn) Verse



Oh say can you see,
by the dawn's ear - ly light,

What so proud - ly we hailed
at the twilight's last gleaming,

Whose broad stripes and bright stars,
thro' the per - il - ous fight,

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With a Picture to Illustrate Each Line of "The Star-Spangled Banner." It Is Expected the National Anthem will be Easily Memorized

## STATUE OF AMERICAN SOLDIER SHOWS SPIRIT OF EXPOSITION

The most complete exposition of governmental activity ever held in Washington, D. C., was recently opened by the secretary of the Department of the Interior. In staging the exhibition the department has two purposes: It would inform the public of the war work done by its technical experts; and secondly, it would advertise its great reconstruction movements, "Americanization" and "Farms for Soldiers." This second, and most important, motive is admirably symbolized by a sculptured figure that stands in one of the corridors. An American soldier is portrayed, home from the war, his sleeves rolled up for the peaceful work which he welcomes with outstretched arms. The work is by Cyrus E. Dallin, sculptor of monuments in many American cities.

This Statue by Dallin, the Utah Sculptor, Forms Part of the Exposition Staged by the Department of the Interior to Mark the Line between War and Peace

## ATLANTIC CITY PROVES FOCAL POINT FOR AERIAL INTERESTS

American airmen are fast coming to regard Atlantic City, N. J., as their eastern rendezvous. Among recent developments, it is announced that the Aero Club of America, the Aerial League of America, and the Aerial Coast Patrol have all designated the city as the official center of their flying activities. These and other organizations are preparing extensive programs for the development and perfection of practical air craft. Instruction schools are being opened, too, by many airmen, who find plenty of enthusiasts ready to pay $600 for a course. It is worth noting that a 16-year-old Mississippi schoolgirl was one of the first to complete one of these courses. She celebrated her graduation by looping the loop with her brother, an army aviator, in the passenger cock pit.

## WATER-METER WHEELBARROW STOPS WASTE AND THEFT

Means of obtaining exact knowledge of the amount of water used by each gardener in the parks of San Diego, Calif., and a method of making dangerous the theft of water by these employes, were found by the municipal authorities in a meter wheelbarrow recently put into commission. A water meter is attached to an ordinary wheelbarrow, and a gardener, before using water, must connect this meter with the plug or faucet from which comes his supply. Tools may be carried on the wheelbarrow.

Waste of Water by Park Gardeners was Stopped by the Introduction of Meter Wheelbarrows. Now Each Man has to Carry His Own Record

## CHILEAN SUBMARINE CREW HAS NARROW ESCAPE

Death looked certain to members of the crew of a Chilean submarine when, a short time ago, the vessel went down in 30 ft. of water in Talcahuano Bay. When a powerful crane hoisted the undersea craft to the surface, several hours after the sinking, the men were nearly suffocated, as they had been standing in the small torpedo room of the vessel, in water up to their necks. It has not been determined what caused the submarine, which was built in the United States, to sink.

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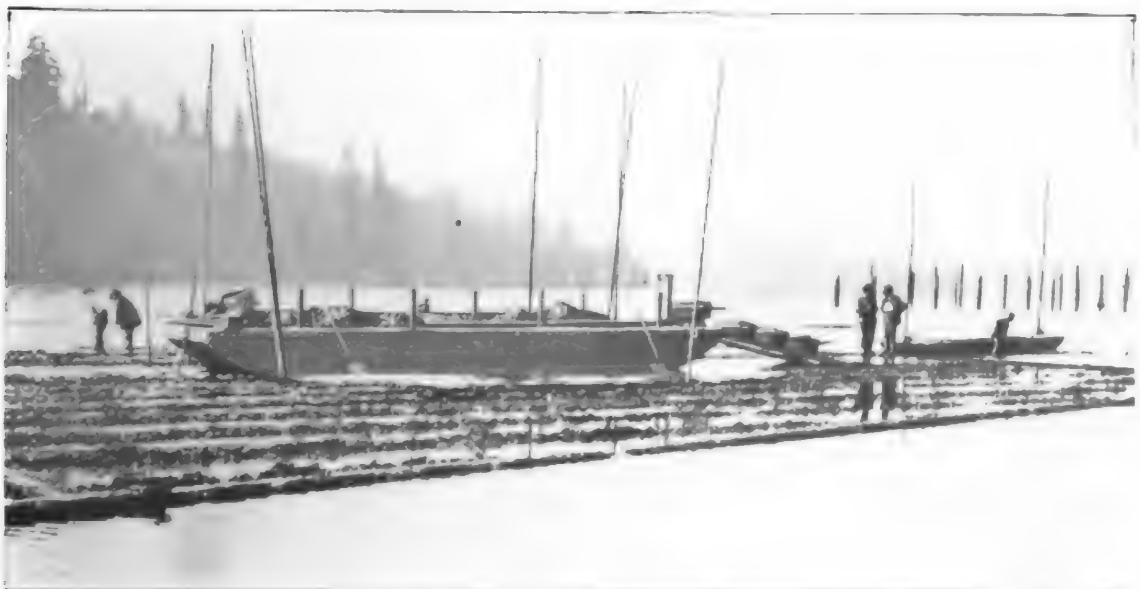
Low Tide on a Washington State Oyster Bed: The Private Growers, Come to Buy of the State, are Raking the "Crop" into Windrows Preparatory to Loading into the Waiting Scow, Whose Permitted Location is Indicated by the Upright Poles, Placed by Deputies

# OYSTER FARMING IN WASHINGTON WATERS CREATES NEW INDUSTRY

By L. W. PEDROSE

THE state of Washington has a peculiar oyster. It is a native bivalve that figured in Siwash potlatch festivals centuries before the first white man was seen. In 1913, the state oyster commission, a newly created body, set out to develop the oyster industry by scientifically propagating the small but nutritious bivalve. The state maintains three beds in different localities of Puget Sound. Impetus was given to the project three years ago when it was learned that eastern oysters, transplanted to Puget Sound, would not propagate because the water is cold.

One of the features of growing the native, so-called "Olympia," oyster is the preparation of beds. Ground must be prepared, for if it is soft, the bivalves will



Each Scow's Crew is Allowed About an Acre to Work, and the Operation is Not Unlike Vegetable Farming. The Oysters, Seen in Rows, are Loaded onto the Scow in the Boxes Which Now Rest on the Gangplank. Harvesting Finished, the Next High Tide Floats the Scow Away



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sink and become smothered. Also, there is the problem of making harvesting easy, and the protection of the crop from frost in winter and from the sun in summer. Protection is obtained by means of diking, which also facilitates harvesting.

A typical tide flat of sand is first prepared by covering it with a floor of gravel, large and small. This "veneering" process is repeated till the ground is "hardened." Near the low-water mark a concrete dike, a few inches high, is built. When the bed is ready, seed and a small quantity of grown oysters are sown on the bed.

The dikes are so low that they do not interfere with the inflowing tide. When the tide is out, the several inches of water maintained over the beds protects the bivalves. Also, this blanket of water conceals oysters, large or small, from their greatest enemies, the sea gulls and crows, which gobble down the spawn, or taking the larger shellfish in their claws, carry them high in the air, then drop them upon the rocky beach and devour the quivering remains left exposed by the broken shells.

For marketing, the oysters are raked into piles at low tide and loaded onto scows—a much more efficient method than tonging, as done in the East.

The state each year harvests its three beds and supplies oysters to private growers at $2 a sack. The oysters begin to mature in six months. This first crop nets the grower a return above the total cost of seed. The next year's income is all profit, and the opportunity attracts many farmers.

Each spring when the state begins to market seed to the oystermen, the buyers send their scows to the reserves. Locations for each scow are marked out by deputies on the ground. At low tide the loading is begun, and with the return of high water, the scows float away to deposit the seeds on their new owner's ground.

## FOREST-FIRE PROTECTION NOW EXTENDED TO NEAR-BY FIELDS

Fire-protection measures have proved so successful in California's forest preserves that the work is now being extended to surrounding hay and grain fields. Forestry officials have learned that field fires are not only the cause of annual loss to the nation, in themselves, but that serious forest conflagrations often are started by them. So the bureau's campaign of public education now includes the fields as well as the forests. As in the forests, campers are warned against the careless use of fire by signs, placed along all the public highways near hay and grain fields.

## PROPELLERS FEED CRAWLING WAGON-LOADING APPARATUS

Contractors will be interested in a new motor-driven wagon loader which crawls steadily backward as the bank of dirt, coal, or other material, crumbles before it. As with other machines of this type,

A State Oyster Bed, Inclosed by Concrete Walls Which Maintain About Six Inches of Water on the Bed at Low Tide, Protecting the "Crop" from Frost, Heat, and Predatory Enemies, Yet Making the Harvest Easy

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The Heavy Propeller Blades on the Lower Shaft of This Wagon Loader Have a Double Function. As the Shaft Revolves They Push the Crushed Rock, Coal, or Other Material toward the Moving Buckets, Thus Giving Each a Capacity Load. The Same Operation Clears a Path for the Wheels of the Loader, Which is Moved Slowly Backward by the Gasoline-Engine Power Plant. The Relation of the Propeller Blades to the Wheel is Seen More Clearly in the Picture to the Right

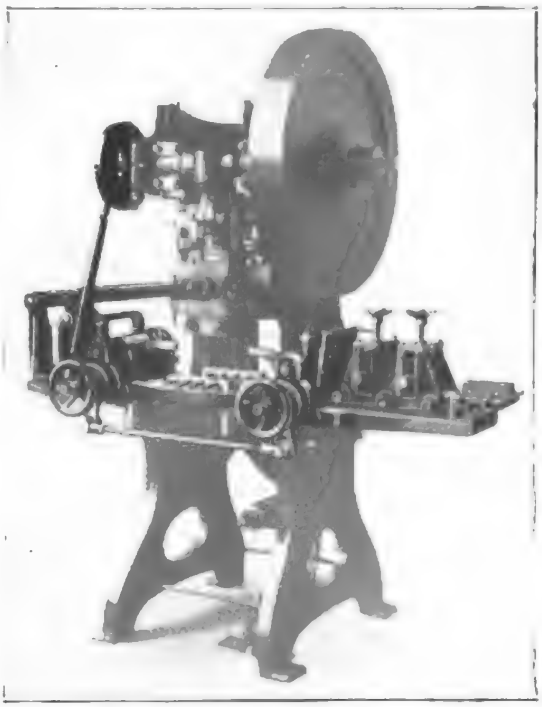
the actual loading is done by an arrangement of buckets on an endless chain. But with this improved apparatus, the shaft at the lower end of the conveyor is extended at either side and fitted with heavy steel propeller blades. The blades push the material toward the moving buckets, thus giving each a full load, and, at the same time, clear a path for the rear wheels as they slowly push the apparatus into the work. With one attendant working at the levers, this machine can load five tons of material in as many minutes.

## MOTOR-TRUCK EXPRESS BOON TO FARMERS

Farmers living along the 110-mile route of a motor-truck express line that is operating between Portland and Salem, Ore., make use of the service regularly. They send their products to the cities and receive their merchandise from them by motor truck. Deliveries and pick-ups are made anywhere along the route. Two large trucks are used daily, and on busy days a third one, smaller than the others, is put on the road.

## ROLL-FEED ATTACHMENT MAKES PUNCH PRESS AUTOMATIC

An attachment for power-driven punch presses, which straightens the stock, feeds it to the punch, and cuts up the scrap, makes such presses practically automatic, so that one operator can run two or three machines. The whole device is mounted on its own bolster plate, attachable to any press. The adjustable straightening rolls first take the curl out of coiled stock, which is then fed by large rolls, driven intermittently by a reciprocating rod actuating toggle-grip clutches. A pitman from the punch head moves the blade of the scrap cutter, the small pieces of scrap dropping into a box or barrel.



The Stock First Goes through the Straighteners at the Right, Then through the Intermittent Feed Rolls Driven from the Crank Disk on the Left End of the Shaft, and Finally through the Scrap Cutter

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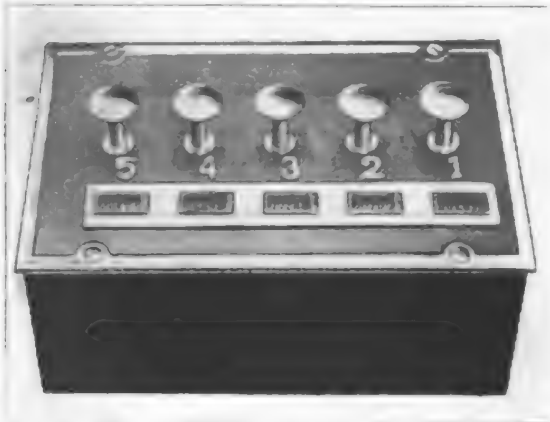
## WAR-TAX SALES REGISTER COMPACT AND SIMPLE

Keeping a record of every sale in which war tax is involved is a stupendous task in the larger retail stores and in soda




**This Machine Registers the Number of Sales Made at Each Different Tax Rate Up to Five Cents, and Is Especially Intended for Soft-Drink Dispensers**

fountains, where each soft drink served means a few cents paid to the government. A small, simple, and accurate registering machine has been placed on the market to make easy the recording of such sales. Plungers, marked with the various amounts of the tax, operate a mechanism which shows the number of sales, up to 100,000, under any particular tax classification. The instrument is intended to be read as a meter by government officials.

## PRIZE IS OFFERED FOR FIRST PORTUGAL-BRAZIL FLIGHT

A recent decree of the Portuguese government authorizes the gift of approximately $32,000 to the Portuguese or Brazilian airman who first flies from Portugal to Brazil. Spurred by the increasing use of airplanes and airships in other countries, Portugal is attempting in this way to establish a commercial air route to the South American republic, which has long been one of the chief purchasers of her products. The airmen who try for this prize will doubtless find it easiest to fly south from Lisbon to the Madeira, Canary, and Cape Verde islands, thence to lonely St. Paul's Rocks, and the Brazilian penal station at Fernando de Noronha, completing the 4,000-mile journey at Pernambuco, on the coast of Brazil.

## STOP CONDENSATION ON PIPES WITH COAT OF GROUND CORK

Cold-water pipes are prevented from condensing moisture on their surfaces by applying to them a coating of ground cork, in the experience of a water company in Pennsylvania. Over a first coat of common paint is spread a special cement paint, and dry granulated cork is applied by hand while the cement paint is still wet. Another coat of cement, and one of common paint, are added, allowing each to become thoroughly dry.

## RECENT PERFORMANCES TEST AIRSHIPS

The airplane, with its sensational development, has lately monopolized public interest to the exclusion of the lighter-than-air machine. The air services of the army and navy have not been misguided, however, but have quietly continued their policy of impartial experiment with dirigibles and free balloons. Two recent events are typical in the satisfactory performances of the machines and in the instruction given the pilots.

The first was the feat of the "A-4," a 160-ft. rigid dirigible which landed on a 30 by 30-ft. platform erected on a hotel roof in the heart of Cleveland, Ohio. The craft left Akron in the afternoon, and, battling a stiff wind, reached the lake city in a little more than an hour. Controlling his ungainly craft with the utmost skill, and using every bit of his knowledge of wind velocity, the pilot was able to bring the basket to rest on the little platform on the seventh trial. From a commercial viewpoint, the performance ranks as one of the most significant in the history of dirigible navigation.

The second noteworthy lighter-than-air event was the revival of free-balloon racing, staged in Akron, Ohio. Seven bags were released on a Sunday afternoon, carrying pilots and meteorologists. Drifting eastward through snow and rain during that night and the next forenoon, the men were kept busy with their instruments and records. On Monday afternoon six of the balloons were brought safely to earth, some in Delaware, others in New Jersey and Maryland. The seventh bag was unfortunately brought down while passing over a steel-manufacturing district in western Pennsylvania. Four bullets from an unknown source ripped through the envelope, forcing the aeronauts to use all their skill in making the long drop.

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The "City of Akron" Was One of the Contestants in the Recent Free-Balloon Race Which has Reawakened Interest in This Once-Popular Activity. The Race Received the Whole-Hearted Support of Air Service Officials Who Realized Its Educative Value. Pilots Learn the Tricks of the Upper Air, and Become Familiar with the Management of the Big Bags, Thus Fitting Themselves for More Advanced Work with Dirigibles. The Race Proved a Success

Airmen See Much of Promise in the Recent Performance of This Big Army Dirigible. Rising from the Air Station at Akron, Ohio, It Battled a Headwind Up to Cleveland in a Little More Than an Hour. There It was Guided to the Roof of a Leading Hotel Which had Improvised a Landing Platform atop a Huge Electric Sign. Six Times the Wind Foiled the Pilot in His Attempts to Guide the "Blimp" to the Little Platform. On the Seventh Trial He Was Successful



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## PHOTOGRAPHIC PLATE MAKES STRANGE TRAFFIC RECORD

A Chicago photographer has made an interesting analysis of traffic on Michigan Avenue by exposing a plate on a pitch-dark night. On development, only the glaring street lamps and automobile headlights were found to have made an impression. Across the plate the latter traced pencil-like lines, thick at a street intersection where traffic is required to slow down, but thinning almost to the vanishing point as the machines sped up for the next corner. All the traffic seems to be headed south, as the red tail lights of northbound machines made no impression on the plate.

This Picture of a Chicago Street was Taken on a Dark, Rainy Night. The Lines were Traced by the Headlights of Southbound Automobiles. The Red Tail Lights of Northbound Machines Left No Trace on the Plate

## ESTABLISH BANK ACCOUNTS TO PAY EMPLOYES

A labor-saving and thrift-encouraging plan of paying his employes has been suggested to a large soap manufacturer in England and probably will be adopted. Under this plan the payroll is sent to the bank with which the firm transacts business, and the wages of each employe is placed to his or her credit in the form of a checking account.

## LESSONS OF WAR REFLECTED IN DREADNAUGHT PLANS

Lessons learned by the Navy Department during the war will be illustrated in the two latest dreadnaughts, the "Iowa" and "Massachusetts," bids for the construction of which were opened in Washington recently. These ships will be provided with the latest protective devices for use against mines and submarines, and will be equipped with mine-sweeping gear. They will be so divided by bulkheads and decks that it will be difficult to sink the vessels, even if a direct hit with a torpedo or shell is made. A ventilating system to guard against poisonous gases will be another feature. The displacement of the warships will be 43,200 tons each, their length 684 ft., and their breadth 106 ft. Speed will be 23 knots. Armament will include twelve 16-in. guns, sixteen 6-in. guns, four anti-aircraft guns, two submerged torpedo tubes, and a number of small-caliber guns.

## EXCLUSIVE NEGRO TOWN BUILT IN VIRGINIA

Negroes only will be allowed to dwell in the new town of Truxtun, Va., built by the United States Housing Corporation to care for colored employes of the naval station at Portsmouth. There are 224 buildings in the town, accommodating 250 families and six stores. The latter will be operated by a stock company. Rents are very reasonable.

## BRITISH NAVAL GUN FIRES WORLD'S LARGEST SHELL

Ever since Germany's monster howitzers shattered Belgium's "impregnable" forts in the black days of 1914, many minds have been fixed in the belief that the Huns alone possessed this superartillery. At that time such was indeed the case; but the allied nations were quick

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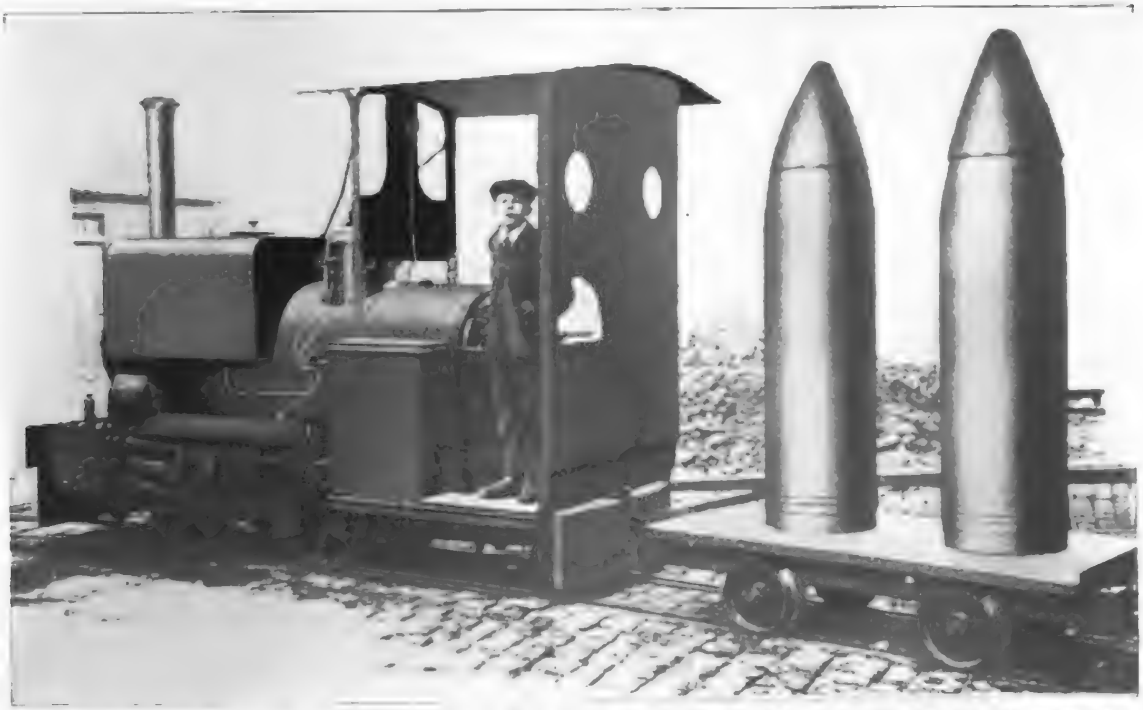

**These Two Armor-Piercing Shells Total Three Tons in Weight, Yet They can be Hurled 30 Miles by Great Britain's Monster 18-Inch Naval Gun. At the End of Such a Journey They can Penetrate a Wall of Ordinary Steel Armor One Foot Thick, Emerging Unbroken on the Other Side. At Point-Blank Range It is Computed That They will Similarly Pierce a Wall of Unhardened Steel Four Feet Six Inches Thick**

to learn, and soon were quietly manufacturing still larger and more terrible weapons, so quietly, in fact, that little is known of these guns even now, save that they exist. It is stated, however, that the British 18-in. naval gun is the largest in the world. At its extreme range of 30 miles it is said to penetrate and emerge unbroken on the other side of an ordinary steel armor plate, 1 ft. in thickness. At 10 miles it similarly pierces almost 2 ft. of hard-faced armor; and at point-blank range will pass through a wall of unhardened steel 4 ft. 6 in. thick.

## MOTORCYCLE TOOL SHOP HAS POWER-DRIVEN EMERY WHEEL

One mechanic finds that he gets many additional jobs since he has equipped his motorcycle as a traveling machine shop. On the sidecar, he has fastened a small vise, and inside has fitted four drawers which contain his tools. Most unusual, however, is the emery wheel which he has mounted on top of the gasoline tank. Arriving at the scene of a job, he stretches a belt from the grinder to a pulley on the main shaft of the engine. Starting his motor with the transmission in neutral, he has at his disposal a power-driven emery wheel which will grind almost anything.

**By Driving the Little Emery Wheel with Power from His Motorcycle Engine, This Mechanic Is Able to Respond Quickly to a Request for Almost Any Sort of a Grinding Job**

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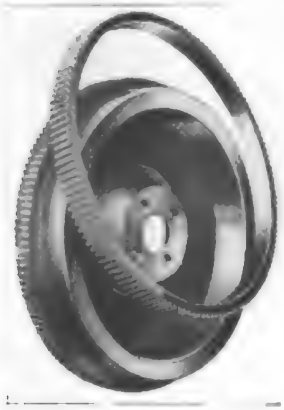
## STARTER STEEL-RING GEAR FITS AUTO FLYWHEEL

Investigation of automobile-starter trouble often discloses the fact that the gear teeth on the rim of the cast-iron flywheel have become worn, making transmission of power from the electric starting motor unreliable. To remedy this, a western concern has brought out a steel-ring gear, which may be fitted on the rim of the flywheel after the worn gear teeth have been removed in a lathe, the mechanism thus being made as good as new.



## POTATO-PEELING MACHINE SHOWN IN MOVIE

A huge and complicated machine for peeling potatoes was shown in a recent motion-picture play. The mechanism, designed by stage carpenters, was a mass of wheels, chains, and sprockets, with a scoop conveyor that carried the potatoes into the machine. An electric motor supplied the power. The potato peeler looked very impressive, but soon proved that it was hardly a practical machine.

This Burlesque Potato-Peeling Machine Looked Very Competent, but It Was Only One of the Properties of a Motion-Picture Studio

## PRIZE OFFERED FOR AIR TRIP ACROSS PACIFIC

A prominent motion-picture producer has made an unusually generous offer to encourage an attempt at flight from California to Australia. The largest prize of $35,000 will go to the first airman to reach Australia from Venice. Provision is made for failure by two consolation prizes. One, of $10,000, will be awarded to the first airman attempting the flight who is able to fly only as far as the Hawaiian Islands. The second, of $5,000, will be presented to the airman making the best showing, if a number try and all fail.

## BRITAIN'S TIMBER SUPPLY TO BE REPLENISHED

War has depleted the United Kingdom's forests to such an extent that the British government is planning to afforest 1,770,000 acres of land. To do this, it is estimated, will require $73,000,000. The planting will be done during a period of 80 years, 250,000 acres to be set to trees the first 10 years. Nearly 200,000,000 board feet of soft-wood lumber will be necessary for building purposes in England this year because of the shortage of dwellings.

## RADIO WAVES IN WIDE BEAM PROJECTED AS DESIRED

A recently developed form of wireless transmitter, announced in England, is arranged to project its waves in a divergent beam, like a searchlight. Its impulses, therefore, may be received anywhere within a certain area, or, by concentration, at a predetermined point. A proposal for the use of this quality contemplates the vertical projection of a wide beam carrying a set phrase, so that the pilot of an airplane, passing overhead, would be automatically notified of his location, receiving names, warnings, or directions through his head receiver. The phrase would be repeated at short intervals.

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## GAS FAILS: BORROW ACETYLENE TO KEEP NEWSPAPER GOING

Newspapers are huge consumers of gas, using it to melt the supply of metal constantly required by the linotype machines. Recently, in a Tennessee city, the gas service failed for several hours, just as the daily paper was in the throes of going to press. The startled but resourceful staff met the emergency promptly. Two cylinders of automobile-lighting acetylene were secured from a neighboring garage, and a larger cylinder from a welding shop near by. With this substitute fuel, which is a better heat producer than the city gas ordinarily used, the paper issued on time, and without trouble; and the edition gave credit, in a black-face line, to the relief contributed by the borrowed acetylene.

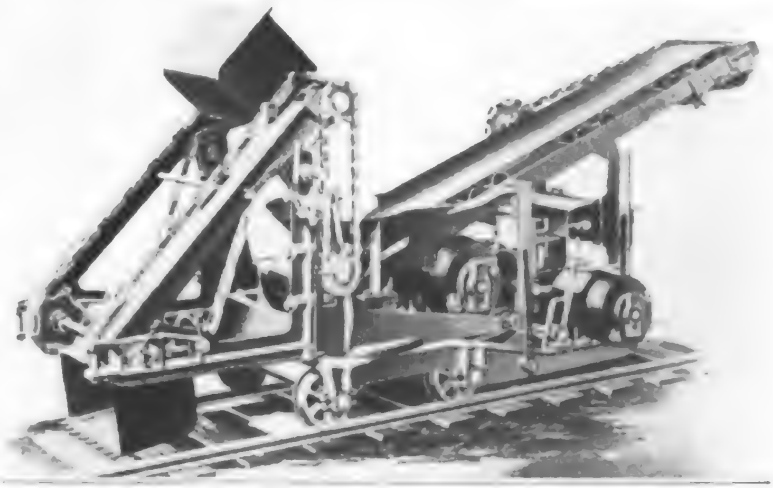
## AUTOMATIC WINDOW SCREENS FOR STREET CARS

A street-car window screen that is always operative has been recently designed. Whenever a window is raised, the screen automatically comes into position, being fastened to the bottom of the window and raised and lowered with it. This makes it impossible for a person to put his head or arms outside of the window, and there is absolutely no chance for a passenger to get hurt. When the window is in normal position, the screen fits between the double side walls of the car.

Here Is a Safety Feature Which Is Entirely Simple Yet Automatic and Efficient. A Wire Screen, Just the Size of the Car Window, is Attached to Each at Its Lower Edges. As a Window is Raised the Screen Follows

## SCOOP LOADER FOR MINES IS SELF-PROPELLING

Designed to work within the space limitations of underground mines, a new scoop-loading machine is both operated and propelled by a pair of 230-volt direct-current motors. The two steel scoops, with renewable toothed-edge portions, run continuously on an endless chain, the whole digger head swinging in an arc at the will of the operator. An inclined belt conveyor at the rear is fed by a hopper and discharges the excavated material into a car. The frame is all steel, working parts being protected from dirt and water.



In This Scoop Loader, Particularly Adapted to Mine Use, the Scoops Work Continuously on Their Chains, and the Digger Head Swings from Side to Side on Ball Bearings. The Loading Conveyor Is at the Rear and the Motors under It

## BRASS NUT AND TWO PENNIES MAKE CIGARETTE LIGHTER

An ingenious amateur mechanic has made a pocket cigarette lighter of decidedly ornamental appearance by the simple means of soldering two English pennies to the sides of a big hexagon brass nut, thus forming a container for the spirit. The steel friction wheel, and the wick and filler plug, were mounted in two holes in one flat side of the nut. Dishing the pennies to form convex sides added to both appearance and capacity.

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## SCHOOLGIRLS GIVE FRENCH PREMIER GOLD PENHOLDER

BY COURTESY OF L'ILLUSTRATION

To express their joy in M. Clemenceau's recovery from the recent attempt at assassination, the girls of a Paris high school resolved to send him a bouquet of flowers. A collection was taken, and it was found that the pupils had given with unexpected generosity. They decided at once to make their gift more enduring; and finally hit upon the happy idea of presenting their beloved premier with a gold penholder with which to sign the treaty of peace. It was delivered a short while ago, with all ceremony, by a delegation of the schoolgirls.

## LIGHTNING MADE FOR MOVIE SCENES BY HUGE COIL

The weather in southern California recently continued fair and cloudless for so many months that the managers of a great motion-picture studio became impatient. Several scenarios called for rainstorms, with lightning and all the other fixings. Rain they could easily imitate, but for lightning they had to turn to their electrical engineer. He responded with a $10,000 electrical machine that rivals the product of J. Pluvius at his best. The commercial voltage is raised by a transformer, which delivers 75 kw. at 40,000 volts. This current passes through four large condensers, through a rotary spark gap, and into the primary windings of the huge coil. The secondary winding stands 6 ft. high by 2 ft. in diameter, and contains 14,000 ft. of wire, giving a spark or breakdown radius of ten feet.

## TANDEM MULTIWING AIRPLANE SEEN AS FUTURE AIR LINER

Airmen have been interested lately in a reawakening of the old discussion of the maximum practical size and design of the future long-distance airplane. It is pointed out that commercial transatlantic planes with their large loads will certainly require 10,000 sq. ft. of wing surface. The problem becomes one of increasing wing surface without impairing flying qualities. A biplane with this great lifting surface and a span of 170 ft. would have to have a wing depth of almost 30 ft., making the plane unwieldy and tremendously inefficient. Piling one wing above another is also unsatisfactory, as these towering multiplane structures are top-heavy and liable to somersault on landing. So it seems possible that the monster superairplane of tomorrow will be a tandem machine; for instance, a quadruplane with one pair of wings in front and the other behind. If this arrangement does indeed find favor, the "old-timers" will chuckle as they remember that machines of exactly that type were flown, and discarded, years ago.

¶ Rich deposits of potash, discovered on the island of Sicily, are said to remove forever the world's dependence on Germany for that substance.

**This Is the Motion-Picture Studio's High-Frequency Coil Which Furnishes the Lightning Effects in All the Storm Scenes Required by the Scenario. The Current Passes, from Right to Left, through the Transformer, through Four Large Condensers, through a Rotary Spark Gap, and into the Primary Windings**

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# SMOKELESS POWDER

By CLARENCE F. ALLEN

WE are all familiar with the story of the old lady who was ready to believe in mountains of gold and rivers of rum, but would take no stock in flying fishes. Popular beliefs are often equally erroneous. No doubt the outstanding feature of "T. N. T." in the popular mind is one of power, yet there are blasting compounds perhaps twice as strong, hence the real virtues of that famous explosive must lie elsewhere.

Similarly, the popular conception of smokeless powder is doubtless that of a gunpowder which very obligingly burns without smoke. This belief, unlike those just mentioned, is practically correct as far as it goes, but experience shows that the advantages of smokeless powder are greater than the name implies. Touch a match to a bit of black powder and a miniature explosion follows, but the same treatment accorded smokeless merely causes it to burn slowly away; in fact, some brands may be difficult to ignite with a match. It is evident, therefore, that smokelessness is not the only distinguishing characteristic of the powders. If one happens to be a sportsman, a day in the open with his favorite weapon will bring to light still further differences. Thus, if the ammunition is of the old black-powder variety, a few shots will foul the bore so badly that to secure further accuracy, he will have to stop and clean it and repeat the cleaning every few shots, while with smokeless ammunition he may shoot all day without cleaning and leave this work until he gets home. Again, in reloading shells in which black powder has been used, it is necessary to wash the shells thoroughly inside and out before reloading, and even then, they will present a dirty and discolored appearance, and with continued use will gradually become so fouled inside that they will no longer take the proper load of powder. On the other hand, with most smokeless powders the shells will need no cleaning, and reloading simply requires the punching out of the old primer, and the insertion of a new one, together with powder and bullet.

Before the Era of Smokeless Powder, Firearms Were Much Heavier, on the Average, than They Are Now, "Kicked" Harder, and Needed Cleaning Every Few Shots to Maintain Accuracy

In addition to these advantages smokeless powder is more powerful than black, so that a smaller quantity will give the same ballistic results as a much larger amount of black. With some smokeless powders a load equal to one-third the usual charge of black, will give the same results as the normal load of black, while with others, a mere pinch dropped in the bottom of the shell will produce results equal in velocity and energy to a full load of black powder. Much depends upon the weapon and the powder adapted to it. In any case, this greater power may be taken advantage of to get equal results with less powder or to get better results by increasing the powder charge. If the weapon happens to be a rifle of the old black-powder type, it is possible, without danger and by simply using smokeless powder and a metal-case bullet, in place of the old lead one, to secure an increase in velocity of from 400 to 500 foot-seconds, and since the energy, or power, varies as the square of the velocity, this is a very appreciable increase in power. If the weapon is especially adapted to smokeless powder (like the so-called high-power rifles) one may go still farther, and even double the velocity. This increased speed not only makes for much greater power but gives a much greater "point-blank" range, and subjects the bullet to wind and like atmospheric disturbances for a shorter time—all of which makes for greater accuracy. (It does not seem to be generally understood that a bullet fired from a gun held in a horizontal position, as in ordinary firing, will fall to the ground in the same time as one dropped from the muzzle. There is therefore, in theory, no such thing as "point-blank" range, but in practice, a bullet flies some distance before its drop is noticeable.)

A bullet traveling at the rate of 1,000 ft. per second is moving more slowly than sound, hence if one is standing at the target he will hear the report of the gun before the impact of the bullet. Modern velocities are in the neighborhood of 3,000 ft. per second, so that at a good



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distance, there is a very noticeable interval between the time of hearing the impact of the bullet and the later report of the gun. In fact, there is almost as much difference as there is in the case of a bullet traveling so slowly one can watch it to the vanishing point. The writer once loaded some pistol cartridges with large round ball and a very small charge of powder, with the result that the bullets traveled like a stone thrown from the hand and could readily be seen en route. In this connection it is perhaps proper to say that if the bullet is large enough, or the conditions favorable, a much higher velocity will not prevent a glimpse of the bullet in flight. The shell from a 12-in. mortar can readily be seen tearing through the air; likewise it can most certainly be heard. High velocity has one curious disadvantage, however, in that a rifle fitted with one of the modern inventions known as a silencer cannot be made silent if the bullet's velocity is greater than that of sound. In other words, there is gun noise and bullet noise, and only the first can be silenced. At velocities below that of sound (about 1,100 ft. per second) the trouble disappears, and under favorable conditions, the report is so silenced that the fall of the hammer may be heard as if the gun had misfired.

The Modern Smokeless, High-Power, Automatic Repeating Rifle Is Light, Has Little Recoil, and does Not Readily Foul, Even When Firing a Shot a Second at Velocities Unheard Of with Black Powder

Smokeless powder also seems to give less recoil than black, this being particularly noticeable with the small-bore, high-velocity loads, which give much greater range and energy than the old-style weapons, yet have much less "kick." They are more pleasant to shoot, accordingly. The reduced recoil has made for lighter weapons, so that while rifles once weighed as high as 16 lb., a modern sporting weapon need not weigh over 7½ lb., and many are lighter. Similarly, military weapons, capable of firing five shots in about as many seconds, are lighter than the old type, which could hardly average one shot in that time. Incidentally, they are more powerful, there being few, if any, that will not put their bullets through the blade of an ax, and "then some." The penetration in wood is several feet. Hence the old log forts would offer little protection against the modern rifle bullet.

Of course, all these improvements have not been gained except at some expense and trouble. Modern rifles must safely stand a pressure of 50,000 to 60,000 lb. per square inch; the pressure of the atmosphere is about 15 lb., which affords some means of comparison.

As tests by the Ordnance Department showed that barrels would not stand a sustained (hydraulic) pressure of much over 35,000 lb. per square inch, it is evident that only the brief period during which a rifle barrel is exposed to high pressure saves it and, perhaps, the shot from destruction, when cartridges giving as high as 50,000-lb. pressure are used; one might almost say they don't have time to burst. The temperature, too, like the pressure, goes skyward upon the firing of the cartridge, and mounts into thousands of degrees Fahrenheit, so that for this reason also, it is only the shortness of the exposure that saves the barrel, since the temperature is far above the melting point of steel. It seems paradoxical, therefore, that a rifle may be fired many thousand times before the wear and tear is of sufficient moment to affect its accuracy—and that, even then, only an expert can detect the difference.

Smokeless powder, therefore, is not only smokeless, but as much of an improvement upon black as present-day electric light is upon the old-time candle.

## WIRELESS MAY CAUSE FIRE IN INFLAMMABLE GOODS

That highly inflammable substances, such as oily waste and cotton, may be ignited by sparks developed from wireless impulses, is the claim of a French scientist. The theory was experimentally demonstrated by the construction of a resonator whose discharge readily set fire to various materials. The increasing use of high-powered radio equipment points, in this light, to a possible new element in the problem of fire protection.

¶ An American manufacturer is now producing a cheap, seamless copper tubing for use as an elastic gas connection.

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Pay-Roll Robbers will have to Arm Themselves with Light Artillery if They Wish to Rob This "Bandit-Proof" Auto Truck. Designed for the Transportation of Large Sums of Money through the City Streets, the Truck Body is Made of Steel Plates, Riveted Like the Sides of a Ship. Bars Cover the Doors and Windows

## CITY BANK DELIVERS MONEY IN ARMOR-PLATED TRUCK

The bold knights who once rode about the lawless countryside in clanking suits of armor plate seem quite amateurish now, when compared with the agents of a Chicago bank who fearlessly haul money through the city in an armor-plated truck. The truck body resembles that of a patrol wagon, with steel bars across windows and doors, and a steel pilot house provided for the driver. The steps at the side and rear fold flush with the body as the doors are closed.

## NEW AIRPLANE AMBULANCE HAS REMOVABLE FUSELAGE BOTTOM

Forced to the ground and seriously injured during a cross-country flight, many an airman has found that the miles which slipped by so smoothly in the air seem 10 times as long during the trip back to camp in the jolty ambulance. Although the airplane ambulance has naturally been recognized as the remedy for this condition, mechanical difficulties have previously forbidden its general use. But in the construction of the latest aerial ambulance, these difficulties seem to have been largely overcome. The ambulance pilot now flies single-handed to the scene of the accident. Landing near the unfortunate airman, he steps out of his machine and lowers the bottom of the fuselage, revealing a comfortable wire stretcher. Placing the victim in the stretcher, the latter is raised by turning a crank at the side of the fuselage.

The Pilot of This Aerial Ambulance is Seen Turning the Crank Which Raises the Fuselage Bottom and Lifts the Stretcher into Traveling Position. This Mechanical Arrangement Is Superior to Previous Methods, Which Necessitated the Presence of at Least One Attendant

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## OLD PALM TREE TRANSPLANTED AS CIVIC LANDMARK

Few busy passers-by gave more than a glance at the sturdy old palm tree which recently grew in a back street of a California city. Still fewer realized that the old tree had stood there since the days of '49. Here and there were those who loved the old landmark, however; and when it was decreed that the tree must make way for a new business block, they had it carefully dug up and transported to another site. This operation was no small task, as the moving company estimated that the roots alone weighed four tons. The expense of the transplantation amounted to about $250.

This Old California Palm Tree was Considered Such a Landmark That It was Recently Moved to a New Site, Two Blocks Away, to Make Room for a Business Block. About $250 was Paid for the Awkward Operation

## FIRE ALARM IS OPERATED BY LIGHT OF FLAMES

Based on the well-known effect of light rays upon selenium, a European inventor has devised a fire-alarm system declared to be so sensitive that the light of a match 20 ft. away will set it off. A selenium cell is placed in series with a battery and a relay, the latter actuating an alarm bell. When the light from an incipient blaze falls upon the selenium, its electrical resistance becomes so reduced that current from the battery passes through it. In tests, it was found that the bell rang, as a rule, within 10 seconds after the fire started. The least illumination that a burglar could possibly work with also sounded the alarm.

## ELECTRIC FURNACE SHORTENS MAKING OF GUN STEEL

Use, for big-gun manufacture, of steel made in basic open-hearth furnaces, previously considered worthless for the purpose, was one of the noteworthy technical developments of the war. All ordnance specifications were satisfactorily met by one American ordnance manufacturer with basic-process metal, and a British producer was wholly successful with a plain carbon steel electrically fused, despite the fact that three-percent nickel alloy was the standard. The acid process, customarily used because of the purity and reliability of its product, takes about three times as long as the electric-furnace method of refining, and the latter process was demonstrated to produce a metal as good, if not better, for gun making, in spite of the old prejudice against it.

## SAFE WEIGHING TEN TONS CUT INTO SECTIONS

A large safe, weighing 10 tons, had been placed in the vault of a bank at New Brighton, Pa., before the door of the vault was set. When the safe's removal was desired, it was found too large to pass through the opening, so it was decided to cut it into sections. Thirty hours of work with an oxyacetylene torch were required, to cut through the ten layers of ⅜-in. steel of which the safe was constructed.

Sections of Steel Safe, Cut Up by Oxyacetylene Torch to Permit Its Removal through a Narrow Door: The Torch Cut through Ten Thicknesses of Three-Eighths-Inch Steel

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View from the Street after the Accident, with the Rear of the Car Tilted High in the Air. Passengers were Rescued from This End by Rolling a Wagon underneath It. The Rear Truck, Which Rested at the Edge, may be Seen Just below the Body

## STREET CAR DIVES INTO PIT UNHARMED: NO CASUALTIES

In a headlong dive to the bottom of a 25-ft. pit, a Chicago street car not long ago carried more than 30 passengers through all the horror of expected injury or death, and then released them with only a few scratches and bruises. Opposite a point where ground is being excavated for a railroad viaduct, the car left its track so suddenly that its occupants had no time "even to catch their breath," as the motorman reported. It made a short turn, shot over the brink, and dropped to the bottom of the chasm without varying from its even keel; and there it stood, propped at an acute angle against the side, its seats in this position forming shelves which kept the passengers separated until they were rescued from both ends. Cool heads among them managed to allay the natural sense of panic. The car itself was practically undamaged. The fact that it did not lose its lateral balance, with all its unaccustomed movements in other directions, is responsible for the happy ending of an extremely perilous and exciting adventure.

The Car's Nose Rested on the Bottom of the Pit in This Position, Still on an Even Keel and Practically Undamaged by Its Dive. Some of the Passengers Escaped through This End

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## WOMAN ENJOYS DAILY FLIGHT DESPITE HER 86 YEARS

Old ladies will never amaze the world as stunt pilots; but nothing seems to

This London Woman is 86 Years Old, Yet She Flies Almost Daily with Her Son, Himself over 50 Years. In the Photograph She is Shown at the Start of the First Flight

stand in the way of an occasional airing in the passenger cockpit of a trustworthy biplane. Anyway, that is the belief of a London woman who is 86 years old. Some weeks ago, at a field near London, she was given her first airplane ride by her son, himself over 50 years. Since that time she has insisted on a flight every day the weather permitted. A better proof of the safety and convenience of flying could probably not be found.

## UNDERGROUND TORPEDO DIGS ITS OWN TUNNEL

Added to the list of interesting but tardy war inventions is a so-called "earth torpedo," of Canadian origin, which bores its subterranean way undetected toward the enemy lines, and then explodes with great force. The burrowing operation is hydraulic. The nose of the torpedo is equipped with an ingenious boring nozzle, and takes with it a length of hose, which a pump in the trench supplies with water at 300-lb. pressure. This part of the performance is silent. In a test, the device burrowed for 200 ft., and then blasted out an excavation 20 ft. across.

## SPILLS SUPPLY THRILLS IN MOTORCYCLE CLIMB

Two motorcycles went over the top in the fourth annual Devil's Despair Hill-Climbing Contest at San Juan Capistrano, Calif., recently. The 500-ft. course up a grade varying from 50 to 76 per cent was topped by one machine in the stock-machine event, and by another in the free-for-all, in which machines of unrestricted mechanical design were used.

There were 22 machines in the stock event and 30 in the free-for-all, and each rider had two trials at the hill. The grade was so steep that nearly all machines that failed to make any appreciable showing either turned over backward and somersaulted down the grade, or dug their rear wheels into the ground until they could move no farther. Broken drive chains accounted for the fact that 50 per cent of the machines failed to make the grade.

Nearly all of the motorcycles were provided with rear wheels fitted with great steel strakes. They would go plowing up the course, roaring like locomotives, and throwing up clouds of dirt. Then the front end would rear high in the air and the machine would hurtle over backward. Almost invariably the rider would slide off over the rear mudguard as soon as the front wheel began to rise, and as he struck the ground would roll as far as possible down the hill to avoid the falling machine as it would come thundering down after him.

With all the hair-raising spills that were taken, it is remarkable that no rider was seriously injured. Several were bruised and scratched, and one spectator sustained minor injuries when a machine turned off the course and ran wild among the crowd. The fact that the riders all escaped injury was due to the remarkable skill they have acquired in rolling clear of the falling machines once they are thrown off.

Dudley Perkins, of San Francisco, who won the free-for-all contest, pocketed $100 as first cash prize. There were also miscellaneous money prizes that brought his total winnings to $750. Orval Healton, of Santa Ana, Calif., winner of the stock event, pocketed a similar sum of money. There were miscellaneous other prizes varying down to $15 for the first five contestants making the best showings in each event. Perkins' time over the course in the free-for-all was 34⅘ seconds. No scoring of time was taken into consideration in the stock event. A crowd variously estimated at from 15,000 to 25,000 persons witnessed the climb.

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## LAUNDRIES FOR AUTOMOBILES THRIVING IDEA

A new form of service to motorists promises to solve at least one problem of the owner of an automobile. In fact this

**The Legend on the Shop Windows Indicates the Nature of the Industry Pursued Inside, Where Autos are Cleaned and Polished "While You Wait" in a Comfortably Furnished Reception Room**

laundry for cars is the latest by-industry of motordom. While the patron waits comfortably in a room furnished with lounging chairs, library tables, reading matter, and decorative palms, his car is being washed and polished to immaculateness, in the shortest amount of time. An enterprising colored man in the West is believed to be the originator of this type of business.

## HOLLAND TO HOLD COMMERCIAL AERONAUTICAL EXPOSITION

An international aeronautical exposition will be held at Amsterdam, Holland, during the months of July and August. As many requests for space have already been received, the directors feel assured that foreign manufacturers will participate on a large scale. Space will be granted to machines of every design and purpose, except that no planes intended solely for military use will be displayed. The exposition was inaugurated on the 5th of July.

## GIANT MECHANICAL MAN WALKS CITY STREETS

For centuries mechanicians have busied themselves with mechanical figures, or automatons, which could imitate the actions of men and beasts. They have devised mechanical butlers, flute players, buglers, tambourine players, and chess players; but it remained for an American inventor to build the steel pedestrian which draws along the city streets a wheeled float weighing more than a ton. The inventor is said to have devoted $15,000 and six years of experiment to perfecting the work. After several failures he adopted the present system of gears, cams, and cranks operated by the 20-hp., four-cylinder engine in the float. The big fellow is controlled quite like an automobile, with a throttle, clutch, and steering wheel. He is 12 ft. high and weighs 2,500 pounds.

**This Iron Man has Marched with His Ship in Many City Parades. The Inventor Spent Thousands of Dollars and Several Years of Experiment on Previous Unsuccessful Figures, Finally Designing This Giant Which Weighs a Ton, and is Driven from the Ship by a Regular Set of Automobile Controls. At the Left the Inventor has Removed Part of the Coat to Permit Lubrication**

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**AIRPLANE RETURNS FROM POULTRY MARKET WITH PURCHASES FLOATING BEHIND**

THE ancient land of Mesopotamia resounded to the tramp of marching armies more than 2,000 years before the Christian era. And since that time the walls of the old towns along the Tigris and Euphrates have looked on the strange ways of many an invader. Yet never before the recent British campaign against the Turks had they seen two strings of dead fowls rise from the market place and float away. A British airman was responsible for this unusual method of transporting supplies. He tied his purchases together in two long strings, fastened them to the tail of his machine, and flew home trailing the novel streamers.

## DREAMS OF SHELL-SHOCKED GIVE CLUE TO CURE

Cases of shell shock and army nerves are being treated by an officer of the British medical corps through study of the patient's dreams. The afflicted man is persuaded to relate the features of any nightmares or other dreams, concentrating particularly upon the emotional recollections. The observant physician is able to identify, by the expression of the subject and sometimes by symptoms of terror, the exact nature of the disturbing vision, and thereby to adopt means to combat its influence.

## REPAIR-EQUIPMENT STATIONS ALONG ELECTRIC RAILWAY

Most travelers have noticed the spare rails which are placed at intervals along every railroad's right of way. Quite unusual, however, is a similar idea adopted by a suburban trolley line to expedite repair work and lighten the task of the electrician. Repair equipment, consisting of an extension ladder and a heavy vise, is stationed at convenient points along the entire route, enabling the company electrician to rush to the scene of trouble on his little speeder, unencumbered by such heavy units. Finding ladder and vise always close at hand, he is seldom forced to ask the assistance of the repair car.

**Stationed at Intervals along the Route of a Suburban Trolley Line, These Repair Units have been Found to Hasten and Lighten the Work of the Electrician**

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## FRENCH SHIP RUNS AGROUND ON SOCIETY ISLANDS REEF

On a reef off the rocky coast of Moorea, rugged and mountainous member of the Society Islands group in the South Pacific, the French cruiser "Kersaint" ran hard aground early this spring. Like most of these islands, Moorea is practically encircled by a submerged bar of coral, which, indeed, makes its harbors the more hospitable by protecting them from storm. It was at a point just outside of Opunohu Bay that the man-of-war failed to make the passage. Men and guns were readily landed, but lack of facilities on the island, whose population is less than 2,000, hampered attempts to right the stranded vessel. The "Kersaint" is a 1,243-ton ship, built in 1897, of 2,200 hp. and 15-knot rating.

The French Cruiser "Kersaint," Hard Aground on a Coral Reef off Moorea, Member of the Society Islands Group

**Opunohu Bay, Island of Moorea, Just Outside of Which the "Kersaint" Stranded: The Rocky and Mountainous Nature of the Island is Clearly Seen, as Well as the Shoals inside the Circle of the Surrounding Coral Reef—an Arrangement Characteristic of the Hydrography of These South Pacific Isles. The Lagoons of These Islands Usually Form Safe Harbors After the Passage through the Reef has been Made**

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¶ The French minister of liberated territories has reported to his government that 250,000 buildings were partly destroyed in the devastated districts, and that 300,000 were completely ruined.

## HUGE OIL TANK IN SCOTLAND OF LEAK-PROOF CONCRETE

Built for American naval purposes, a capacious oil-pipe line across Scotland from the Clyde to the Forth now reverts to British uses. It has been improved by the construction of a 60,000,000-gal. concrete reservoir at Rosyth, on the Forth, whose remarkable leak-proof quality is credited to the unusual care and patient thoroughness applied to its erection. The mammoth tank is in two sections, the dividing wall built to allow their independent use, and is seated upon solid rock, of which 300,000 cu. yd. was excavated. The floor, 2 ft. 9 in. thick, was laid in checkerboard sections, alternate squares being allowed to set and shrink before the intermediate spaces were filled. The walls, 35 ft. high, were built in lengths of 54 to 58 ft., with a 3-ft. space between adjacent ends. This space was closed with a steel plate, extending from top to bottom, its edges imbedded in the walls, forming an expansion joint. Fine concrete filled the interstices around the plates and was applied also to the finished mass concrete of floor and walls. Rod reinforcing was used in the walls and expanded metal in the floor. Another wall 16 ft. high bisects each section of the tank. The whole is roofed over with arched timber construction supported on concrete pillars and timber posts. The roof area is 7⅛ acres, the reservoir with its surrounding roadway occupying 11¼ acres.

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## ALLIES IN RUSSIA CAMPAIGN AMID STRANGE SURROUNDINGS

For an entire month of this last spring, the allied troops stationed along the Murman Coast of northern Russia learned to go about their work with the thermometer registering 40° below zero, and with the sun below the horizon 20 hours a day.

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A British Detachment from the Allied Expeditionary Force in Arctic Russia is Shown as It Drags a Light Fieldpiece along the Crusted Surface of the Snow. Below is Seen a Similar Piece Guarding a Lonely Outpost. Supplies Reached Many of These Outposts Only after Long Journeys by Reindeer Sledge

PHOTOS BY CENTRAL NEWS PHOTO SERVICE

They were kept in good health, however, by liberal issues of fur clothing, and the construction of well-lined log barracks, heated by Russian stoves. In addition, Major Sir Ernest Shackleton, the antarctic explorer, was attached to headquarters as an authority on arctic equipment, while a number of Canadians with experience in Klondike conditions were detailed as instructors in arctic life.

## LITTLE TANK TRUCKS SUPPLY GASOLINE TO AIRPLANES

During a busy day at a large aviation field the amount of gasoline and oil consumed is enormous. The supply man at the wheel of his little tank truck, known as the "gas flivver," is kept busy darting from one thirsty plane to another. The filling apparatus used is of the portable type seen in every large garage, but is equipped with a hose of extra length to reach to the less accessible tanks of the bigger planes.

A Little Truck of This Sort Replenishes Gasoline and Oil Tanks at Every Large Aviation Field. The Plane About to be "Gassed" Is a Le Pere, One of the Government's Latest and Fastest Fighters

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# WATER—THE MAKER AND DESTROYER OF ROADS

By HARLAN H. EDWARDS

This New Monolithic Brick Pavement has been Broken by the Heaving or Swelling of the Wet Earth Below, Caused by Thawing of Frozen Ground

HIGHWAY construction is an art neither easily nor quickly acquired, but rather it takes years of study and experience for one to be able to build the best road in the best place. However, though highways and railroads seem to have little in common, many of us are prone to make the same mistakes in construction

Water Flows from Both Directions into This Low Place in a Road and Stays Until It Dries Up. Two Hundred Feet of Tile would Remove This Mudhole

that the railroad men did years ago. Hard-road construction in many places seems to be taking on the aspect of building heavy-slab bridges over the land—requiring 8 to 11 in. of solid-concrete slab—and neglecting more or less the most essential feature of good construction: effective drainage. One of our great railroad systems recently spent nearly $2,000,000 to provide adequate drainage for one of its divisions, with the expectation of recovering that amount in two years by decreased repair and maintenance expenses. Such work is equally effective on our highways. Get the water out of the road!

Water is as essential to the making of most roads as the road materials themselves, but an excess of it can destroy almost overnight the results of much careful work. It is not the flood waters in times of heavy rains that do the greatest damage, but rather the standing waters along the roads and the continual seep of underground water are the silent agents of destruction. More money is lost or wasted annually by neglecting to provide adequate facilities for drainage than it would take to build a wide, hard road across the United States, with connecting roads to every state in the Union.

Permanent foundations, having uniform bearing qualities, are essential to all types of engineering structures. Roads are no exception. These essentials, however, are impossible where, through accident, neglect, or design, side-drainage ditches are allowed to become blocked with earth or débris; tile drains clogged up or their outlets removed, or, in various other ways, the rapid removal of the excess water is stopped.

Water is as powerful as a high explosive, but does its work silently. By freezing, it can lift the heaviest loads, crack or break the heaviest paving slabs, and if permitted to saturate the soil under a road, it may reduce or totally destroy the load-carrying capacity of that road. It has been the ruin of many pavements which should have lasted for years.

Earth roads have been the greatest sufferers from water, and it is upon them that the greatest amount of money has been wasted. Whether through ignorance or neglect, much expense has been incurred in scraping the surface of the road when the trouble lay below the ground. Here and there along every road, we find small depressions in which water always collects, due to which the road at those

Such Holes as This Are Common on Our Earth Roads. A Corrugated-Metal Pipe Culvert (Seen at the Side) under the Road, Was So Near the Surface That It Collapsed under Heavy Loads, Cutting Off All Subdrainage

Wooden Culverts Are Seldom Satisfactory. At Best They Are but Temporary, and Become Dangerous Obstructions to Traffic



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places is always a bog—a trap for motorists and a reducer of loads that can be hauled over the highway. A few dollars spent on deepening the side ditch through the high point of the road, or laying tile from that section to an outlet lower down, would permanently remove that obstruction to highway traffic.

This Road Had a Side Slope of About Two Inches to the Foot, Causing the Formation of Deep Ruts by Side Thrust of Automobiles. By Maintaining the Normal Crown of One Inch, This Condition would have been Avoided

A little farther along the road we may find a strip of road which is always soft, "rubbery," and rutted — the first to become impassable and the last to become fit for travel. It has always been that way. No amount of dragging or grading could improve it, yet a few lines of tile laid two to four feet deep here and there in the affected area, would have corrected the trouble. How many times have farm entrances been built through a side ditch without providing for the flow of water bound to occur at times; or if provided, how many times was it not made with thin metal pipes poorly protected from being caved in by traffic, especially at the ends, or with wooden boxes subject to rapid decay and destruction! Culverts and underdrains built of vitrified tile, concrete, or iron pipe are permanent, efficient, and economical in the long run.

This Road has Just been "Graded." The Steep Side Slopes and the Heaps of Sod in the Middle Should have been Worked into the Shoulders of the Road

Ground water is not the only source of trouble on the earth road. Excessive crowning of the road surface promotes poor surfaces in equal degree. In many places, officials have, by their "working" the road, actually ruined what was a fairly good surface, and left instead a road with side slopes so steep that a flivver travels cornerwise like a trotting pug dog, or, if the road is wet, everybody crawls along the crest like a boy on the barn roof. And this is but one bad feature. By the steep pitches, the side thrust of machines traveling at good speeds make deep ruts lengthwise of the road—ideal retainers of water and promoters of mudholes. In times of rain, also, these steep slopes cause the road to wash in crosswise ruts, making the surface more like a corduroy road—impossible to travel in safety at speeds faster than a walk. The trouble has been that in giving instructions for dragging and grading the roads, everyone has said "start at the sides and work toward the center," forgetting all about the good rule that the road should have a maximum crown of one inch to the

Concrete of Such "Soupy" Consistency as This has Lost More than Half Its Strength, by the Use of Too Much Water in the Mixing. The Standard Mix for Road Slabs Should Be as Dry as Possible but Still Workable

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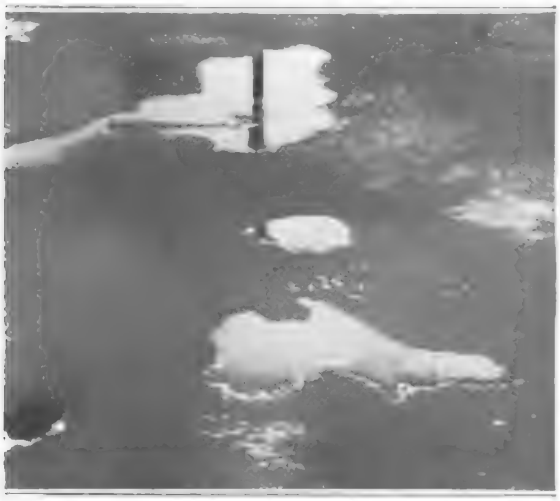
foot. It matters little whether we begin at one place or the other, or whether the dirt is moved inward, outward, or any other way, so that the proper shape is



Wear on Concrete Road Caused by Poor Mixing and the Use of Too Much Water

obtained—a well-kept, slightly crowned road, comfortable and safe to travel and easy to maintain.

For most of our road soils, the use of a light grader once or twice a year and the systematic use of a light, one-horse drag to smooth and compact the road after every rain, will do more toward promoting good earth roads than any other method. Many heavy graders, levelers, and other forms of road machinery, so often operated by inexperienced men, actually do harm to the roads, in addition to wasting money in their operation. Often we find once nicely shaped earth roads, which needed just a little trimming by a light grader or the intelligent use of the drag, left by these men with steep side slopes and a pile of sod in the center of the road, dividing the traffic into two lines, wearing the road into ruts, and causing many a traveler to say uncomplimentary things about the road commissioner. Of course, during continued rains earth roads will be more or less impassable, but when well drained, they dry out quickly.

The earth road is the foundation upon which all other surfaces are placed, and upon which we should depend for the load-carrying capacity. When dry, it will support any load put upon it. When wet, its bearing capacity is small. Hard roads laid over it are but wearing surfaces, keeping the surface water from penetrating the earth foundation and providing a smooth track over which vehicles may be moved with little effort. The load-carrying capacity of these roads, like the earth roads, is determined by the condition of the supporting soil at its worst state. Why not increase the load capacity by strengthening the foundation—the only logical way—that is, by keeping the subgrade dry? Money spent in this way is an investment yielding large returns over an indefinite period of time.

Efficient subdrainage, therefore, is one of the most important items to consider in the design of hard roads. Although some water is necessary in gravel or stone roads, in order to keep the binding material from being carried or blown away, the amount in the earth below should be kept far below the saturation point. In the South, open ditches may possibly serve this purpose, but in northern climates, where the ground freezes to a depth of from one to three feet, tile is necessary in soils that do not have good natural drainage. In the spring, when drainage is most needed, the walls of the ditches are frozen up, preventing the escape of any ground water to them. When thawing takes place, it does so both from the top and bottom of the frozen section. The water from the surface is disposed of by evaporation, or by natural run-off through the side ditches, but the water released by thawing below the surface has no outlet except by some porous stratum below the frozen portion, or by tile. If neither is present, as is most commonly the case, the moisture so released serves only to raise the level of the water in the soil, thus increasing the height of this water with every freeze and thaw until the whole roadbed becomes saturated, the first heavy load breaks through the "crust," and we say "the bottom has dropped out of the road."

Nor is this characteristic of the earth or stone or gravel roads alone. On the

A Case of Lack of Drainage, Caused by a Mistake in Surveying: By Placing a Culvert One Foot Too Low, and Grading the Road to It, the Use of a Natural Outlet for the Water was Lost. To Eliminate This, It will Only Be Necessary to Deepen the Ditch Two Feet a Little Farther Down the Road

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40-mile road between Cleveland and Akron, Ohio, over which so much heavy trucking of war materials was done, several short sections of pavement, aggregating about 1,000 feet, were destroyed a short time ago under the abnormal military and commercial motor-truck traffic. The broken sections were on a three-year-old brick pavement, wherein 4-in. paving brick were placed on a 6-in. concrete foundation, the joints between the brick being filled with cement grout, or mortar. In all fairness to the materials used, it must be said that the workmanship was not first-class and that the specifications were at fault in not providing a definite system of drainage for the road. When traffic first increased, the pavement slab showed signs of failure. Before long, those spots were but a mixed-up mass of individual brick, mud, and concrete—no piece of which was more than two feet in diameter—through which the trucks made their way as best they could. Here was an excellent example of water as a destroyer of roads. The foundation of the road was a fine undrained clay, which had become saturated with water, making it a nearly fluid mass incapable of supporting anything not of floatable nature. Judicious use of tile here, costing but little, would have saved an expensive paving slab costing several thousand dollars. It is interesting to note, also, that on other sections of the same road, carrying the same traffic, where the brick surface was laid upon a stone or gravel foundation without the aid of concrete—a much less expensive form of construction—the pavement withstood the traffic perfectly, the essential difference between the two being a well-drained subgrade.

Water as a destructive agent, however, is not confined to the foundations of roads, but is just as dangerous in hard-road slabs. Without it, they could not be built, but an excess of it is very injurious, especially in concrete roads or roads in which concrete is a component. Until recently, many road builders thought that concrete, mixed to almost any consistency, would be usable in construction work and give the same strength, hence we have seen many roads laid with concrete of a consistency better described as "soup." From a great number of experiments, made in the Structural Materials Research Laboratory, at Lewis Institute, Chicago, however, it has been established conclusively that the amount of water necessary to obtain maximum strength would make a somewhat dry concrete—too dry for ordinary use—and that to obtain the greatest strength, the least amount of water that will produce a workable mix should be used. To arrive at this conclusion, thousands of concrete cylinders were made, varying one thing, then another, to ascertain the proportions

**The Use of Tile or Other Permanent Means of Drainage would Eliminate Road Conditions Such as This**

of cement and water which should be used in different mixes to obtain the strongest concrete. From these, the "normal consistency" was obtained which would enable the resulting concrete to withstand the greatest compressive test. Any larger proportion of water than that which produced the "normal consistency" would decrease the strength of the concrete rapidly. An excess of but 13 per cent of water decreased the strength of the concrete 20 per cent, this being equivalent to a reduction in strength which would have been caused by omitting 33 per cent of the cement. This shows emphatically the importance of controlling the amount of water in concrete, and gives the reason why roads made of "soupy" concrete now show so much wear and lack of strength.

It will be seen, therefore, what damage such an apparently harmless thing as water can do. It may make some roads impassable, undermine the strength of others, and destroy much of the strength of the rigid pavements in the making. Hence the logical remedy should reach the root of the evil—get the water out of the road. Money spent in this way is never lost. It is always working, helping to make our roads permanent for generations to come, and will be earning dividends long after all of us are gone.

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¶The War Department's 15,000,000 excess hand grenades are to be remodeled as penny and dime-savings banks, and will be distributed to schoolboys and girls who can show one or more War Savings Stamps earned during the coming summer.

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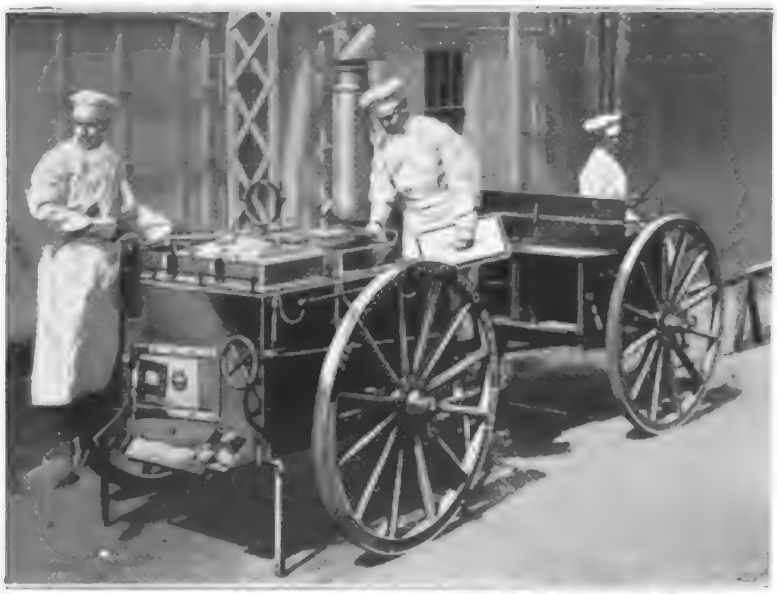
## ARMY FIELD KITCHEN SERVES MEALS TO BOY "HIKERS"

Members of boy "hiking" clubs in the vicinity of Toronto, Canada, are experiencing a new joy in the use of a regulation army field kitchen, which is loaned to them, on application, by the local Rotary Club. The kitchen consists of a large steel tank on wheels, hauled as an auto trailer. A coal fire boils water in the tank, the constituent parts of a dinner being contained in six tin kettles immersed in the water. It cooks a three-course meal for 150 persons or prepares 900 cups of coffee at one time.



This Auto-Trailer Field Kitchen, Regulation Army Type, is being Loaned by the Toronto, Canada, Rotary Club to Any Boys' Organizations That Wants It. It Cooks 150 Meals, or 900 Cups of Coffee, at One Time

## ANCIENT HALL REMODELED IS PRINCETON'S WAR MEMORIAL

Nassau Hall at Princeton University, built in 1756, is to be remodeled as part of the school's plan for a fitting war memorial in honor of the 132 men who left their studies to give their lives in response to their country's call. The entrance hall and a number of small rooms are to be torn out to make space for a new Memorial Hall, adjoining the Hall of the Continental Congress. Princeton heroes of all wars will be registered on tablets preserved in this room, which is to be paneled in oak or Indiana limestone. For each of the immortal 132, it is the intention to endow a scholarship, as a further means to perpetuate their memory.

## FEDERAL LOAN BANKS PLANNED TO HELP HOME BUILDERS

To encourage the building of homes, a Federal system of home-loan banks is proposed by the Department of Labor, and already has found support in congress. The success of the Federal farm-loan system, established three years ago, inspired the new plan. Its operation does not contemplate the direct loan of government funds to home builders, but the organization of a series of home-loan banks, one for each of probably 11 districts, to act as clearing houses for local building and loan associations. The banks would issue bonds for up to 80 per cent of the mortgages deposited with them, the interest rate being not more, and probably less, than five per cent. It is reported that building and loan associations favor the plan.

## BRITAIN'S PREMIER MODELED IN RUBBER FOR CHILDREN

Lloyd George, Great Britain's dynamic premier, has been fashioned in rubber, for the amusement of the children and grown-ups of the island. Rubber is an appropriate material for the little figure—the harder he falls the higher he bounces.

BY COURTESY OF THE SKETCH

¶Air risks are now being underwritten by a well-known accident insurance company. The policies cover injury to pilots and passengers, public liability, and property damage, and the premium rates at present are four times those of automobile insurance.

Where a Heavier Car would have Made a 50-Foot Plunge into the River, This Light Auto Stuck in the Bridge Rail; but Before It Stopped, It had Hurled a Pedestrian to His Death. In the Circle the Car is Seen Overhanging the Water, in Which Position It Remained Until a Wrecking Crane Hauled It Out

## AUTO SMASHES BRIDGE RAIL AND DROWNS PEDESTRIAN

One of those strange fortuities that determine the fate of men as surely as the least of animate creatures, snuffed out the life of a Chicago pedestrian a short time ago by hurling him from the security of the Rush Street bridge into the river, 50 feet below. A light auto swerved, its driver said, by contact with a heavier machine; smashed through the bridge rail, threw the man on the sidewalk to his death, and then stopped, its forward portion suspended in mid-air above the water.

## PANAMA LOAN SUBSCRIPTIONS CARRIED IN SUBMARINE

The Canal Zone promptly and handsomely oversubscribed its quota of the Victory Liberty loan; but on the last day of the drive the committee decided to give the total one last boost. So they arranged with the naval authorities that a submarine should make the trip from the Atlantic to the Pacific end of the canal, carrying subscriptions addressed to the loan committee in Balboa. Nearly two thousand applications, amounting to $360,-350, were secured under this stimulus, and were carried on the eight-hour trip. Each subscription was mailed in a specially printed envelope which will eventually be returned to the subscriber as a keepsake.

Victory Loan Subscriptions Received in the Panama Canal Zone on the Final Day of the Drive were Sealed in These Envelopes and Carried to the Committee in a Submarine

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## CROSS SECTION OF TRANSPORT SHOWS TROOP BERTHS

To increase the efficiency of available shipping tonnage during the war, every article destined for France was "knocked down" and packed in the smallest compass possible. Bones were even removed from

This Model Cross Section of the Huge Steamship "Leviathan" Shows How the Luxurious Passenger Steamer Became a Crowded Troopship. Every Available Inch is Devoted to Bunks, Mess Tables, and Other Military Purposes

fresh meat. While the latter method is "impracticable" in hastening the homecoming of the American troops, every man who returns is willing to testify that no space goes to waste on an American troopship. The large-model cross section of the giant "Leviathan" shows how this and other luxurious passenger steamers were remodeled to furnish a maximum of space for bunks, mess tables, recreation spaces, and other military needs.

## FIRE-RESISTING BRICK MADE FROM SAWDUST

The making of fire-resisting brick from sawdust is an industry recently developed in the Pacific Northwest. Although practically any kind of vegetable matter can be used in the process, sawdust is chosen because of its cheapness and abundance as a waste product from the sawmills.

The new sawdust brick, manufactured under a secret process, may be called an achievement of chemistry, since the binder which gives it its strength and noninflammable qualities is a chemical compound, and the mechanical phase of its production involves nothing new.

The pulp, formed of the sawdust and binder, is shaped as desired and subjected to pressure, varying in intensity with the product being manufactured. Without baking or burning, it is allowed to set for eight hours. This completes the operation, unless it is desired to put a polish on the product, as in the case of fine tiling or fancy brick.

The product has been subjected to exhaustive tests and has proved adaptable and satisfactory for the making of brick, both building and paving; hollow tile; roofing and floor tile; culverts, conduits, refrigerators, and other molded forms, taking the place of clay products. A sawdust brick, produced and pressed without the aid of machinery, was subjected to a pressure of 77,820 lb., or approximately 2,500 lb. per square inch, before showing signs of checking or giving way. The test was remarkable, according to chemical engineers, considering the fact that the sawdust brick weighs about one-third as much as the ordinary brick.

In another test, the flame of an acetylene torch was applied to a brick for two minutes, but only charred the surface slightly. Being an almost absolute nonconductor of heat, the portion of the brick not touched by the flame was cool during the operation. As a further test of the brick's durability, it was soaked in water for 66 hours, then placed in a refrigerator and frozen for a period of 120 hours. Next it was placed in a baker's oven, as hot as it could be fired. It came out of these rigorous tests without showing any evidence of checking. A vitrified brick, tested at the same time, went to pieces after 10 minutes in the oven.

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The sawdust material stood up as well under an electrical test as it did in that of temperature. A 10,000-volt current was applied to it, while dry, and one of 110 volts when wet, before it gave way.

Expansion and contraction of the new material are so slight as to be practically negligible. If desired, it can be applied and rolled as a single slab. For floors it is noiseless, resilient, and unaffected by water. The same advantages recommend it for paving.

# Proposes Electric Dirigible to Carry Mail

AN electric-trolley line winding across the country, with huge gas-bag cars flying in mid-air above it, is the peculiar feature of a Buffalo, N. Y., inventor's proposal for the transportation of mails. The dirigible's otherwise conventional form is improved by the addition of a hot-air duct between the car and the gas bag above. The electrically heated air from the car thus serves to regulate the buoyancy of the bag. Reasonable variation in altitude is allowed by feeding the double trolley cable from a winding drum. The trolley conductor itself is a double rail carried on A-shaped supports.

It is obvious that exceedingly firm anchoring would be required for this structure, or the insistent pull of the big bag in a high wind might conceivably trail great lengths of it across the fields, with terrifying results. But the fact most trying to those who aspire to apply electric drive to aerial uses, is that an electric motor of the low figure of 100 hp. would weigh scarcely less than 3,800 lb. A gasoline motor of equal power might weigh no more than 200 to 250 lb. This leaves so tremendous a margin for fuel cargo that any apparent advantage in supplying power from the outside is effectually dissipated. The designer of the system described suggests, as an alternative form, a smaller gas bag equipped with wings — a queer vehicle, half dirigible and half plane.

**Trolley-Dirigible System, Electric-Motor Driven, Proposed for the Carrying of Mails, Particularly over Sparsely Settled Territory: The Pipe from Car to Gas Bag Carries Electrically Heated Air for Regulating the Buoyancy. The Trolley Cable is Wound on a Drum, Allowing Adjustment of Altitude**

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## POURS CONCRETE INTO WALLS THROUGH SPOUTS

Before pouring any concrete for the walls of a San Francisco pier shed, the contractor completed the inside forms

Special Spouts are Seen on the Outside of the Structure, through Which the Concrete was Poured from the Roof

from floor to roof. Building the outside forms one-fourth of the distance up, he poured the concrete from the roof through special spouts. When it hardened he built another section and used the same spouts by cutting them off to the right length. The same was done on the third section, and the last section was poured directly from the roof without the use of spouts.

## AMERICANS GONE TO FRANCE TO TEACH HOME COOKING

Four Americans, expert in the art of canning and drying, have gone to France to teach that nation how to "put up" fruits, vegetables, and meats at home. This is new work to the French, who now rely upon factories for their canned goods. The Americans, sent by coöperation of official agencies in both countries, will confine their efforts to instructing the teachers of French agricultural schools, who will pass the knowledge on to the people. Motion pictures as well as canning paraphernalia are included in their equipment.

## AERIAL MAIL CARRIERS PROUD OF FIRST YEAR'S RECORD

The Aerial Mail Service is proud of the record made during its first year of operation. In contrast to the gloomy predictions made at its inauguration, the service has been a complete success. Commercial flying has proved far different from the military game. The six planes with which the service started have not fallen to pieces as was prophesied, but are still in use and still driven by their original engines. Millions of letters have been carried, and in all varieties of weather, the records showing that a schedule trip was made on March 29 last, in the face of an 80-mile gale.

This Banner was Displayed at a First-Birthday Celebration of the Aerial Mail Service. Both Pilots and Postal Officials Are Proud of the Record Made during the First Year. The 128,255 Miles Traveled have been Flown in All Sorts of Weather and with Only 36 Forced Landings, All Due to Mechanical Trouble

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## CONCRETE STEAMER UNHARMED BY POUNDING ON SEA BEACH

There is one Norwegian sea captain who is thoroughly convinced of the seaworthiness of his concrete ship. Leaving Norway for a French port some time ago, in command of the first reinforced-concrete freighter to be commissioned in the Norwegian merchant marine, he encountered the stiffest kind of weather. He was pleased to find that his ship rode it out splendidly. But on the return trip, the air thickening and the waves running higher, his ship was forced off its course and hurled on the flat, sandy beach at the mouth of the Somme River. The pounding was so vicious that the captain expected his stone ship to shatter like a crockery pot. He was happily disappointed. After three hours of this punishment the sea calmed, receded, and left the vessel high and dry, but sound as a dollar. Astonished, the captain made his tour of inspection and was unable to find one crack or fracture. Waiting high tide, he floated his ship and made for the nearest port.

## ENLISTED MEN SWIM WHILE SUITS ARE PRESSED

Those in charge of the Soldiers' and Sailors' Club in Seattle seem to understand the enlisted man's problems, and to realize in particular how anxious he is to appear his best while on leave. So, among other things, they have provided a tailor service which mends and presses his clothes while he takes a plunge in the club's swimming pool.

Between Swims in the Big Tank, the Sailor Instructs the Tailor Just How He Wants His Clothes Pressed. With This Service a Soldiers' and Sailors' Club of Seattle Comes to the Aid of the Enlisted Man, Modestly Claiming to Lead the World in This Venture

## RAILWAY SPEEDERS QUENCH FIRES IN AMERICAN CAMP

In the American army's supply and concentration centers every precaution is taken against fire, which so readily consumes the wooden buildings and the accumulations of material. Fire buckets, extinguishers, and similar apparatus are always at hand. In one supply camp in France advantage is even taken of the narrow-gauge railway tracks which run to every corner of the reservation. Several motor-driven speeders have been fitted with chemical tanks, hose, and hand extinguishers, and thus equipped are given the right of way and rushed to the scene of conflagration.

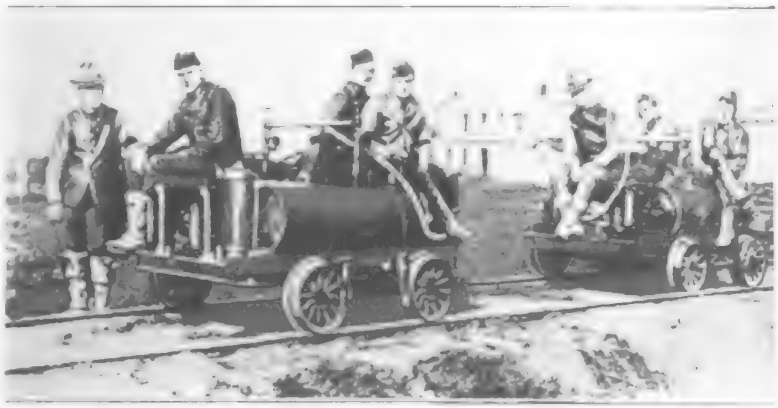

PHOTO BY SIGNAL CORPS, U. S. A.

These Little Railway Speeders may be Rushed over the Narrow-Gauge Tracks to Any Endangered Part of a Great American Supply Center near Bordeaux, France

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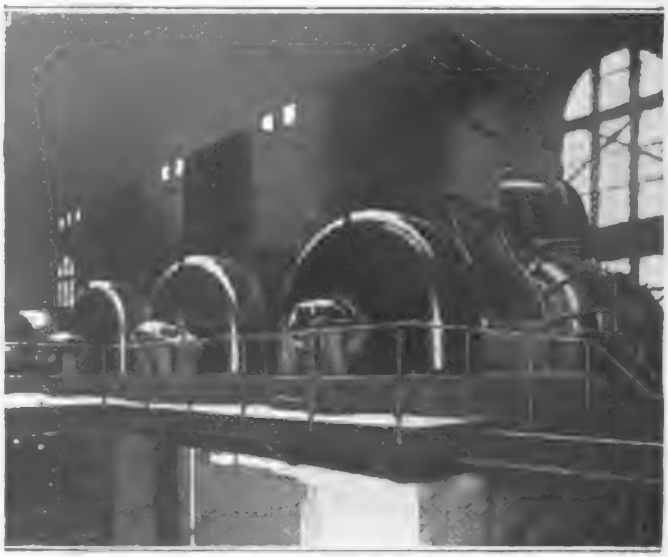
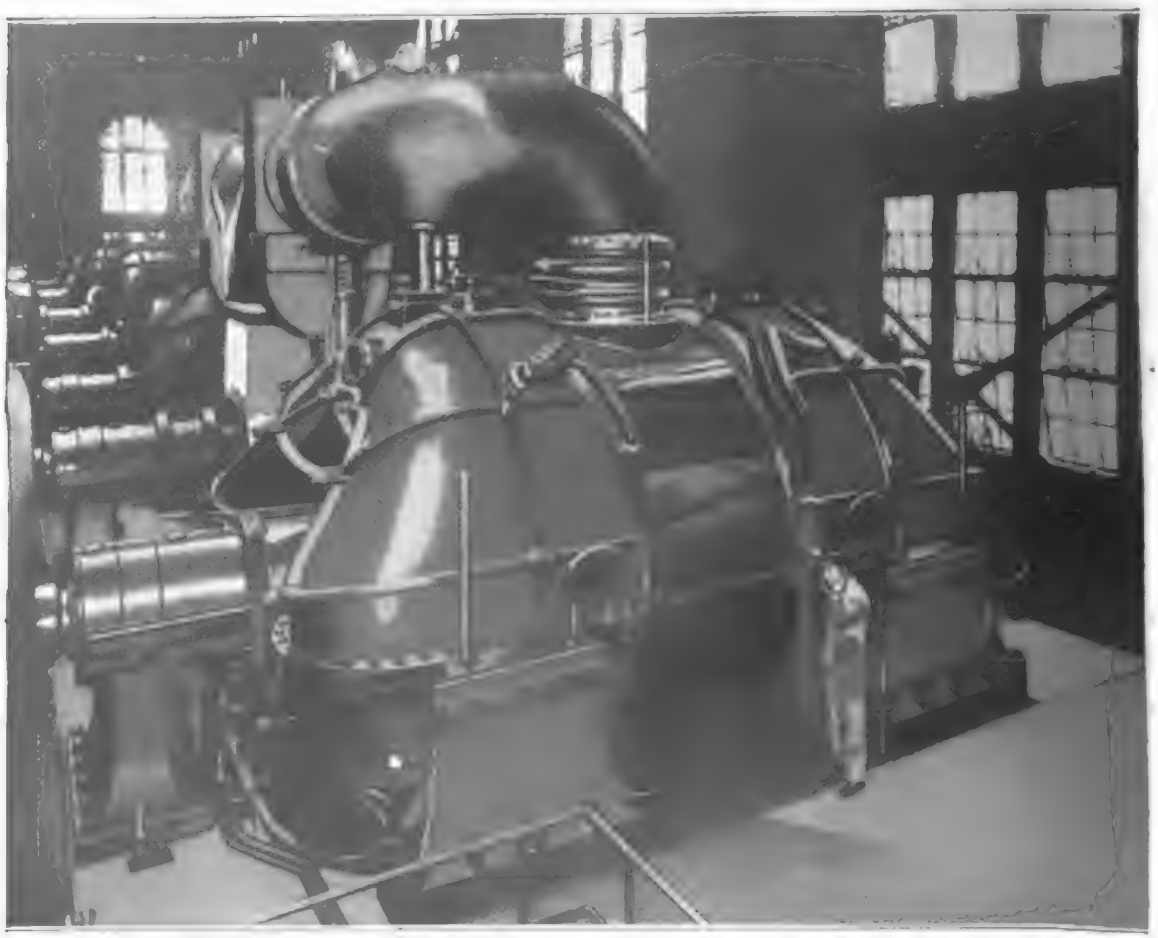
# LARGEST STEAM TURBINE INSTALLED IN NEW YORK

The largest steam turbine ever built, developing 100,000 hp., has been installed in a street-railway power house at New York City. It is also the first three-cylinder cross-compound unit in America. Superheated steam at 205-lb. pressure enters the high-pressure element and exhausts into the two low-pressure elements in parallel, condensing at 29-in. vacuum. At full load, the unit takes 826,000 lb. of steam an hour. All the elements, which, in an emergency, can be used independently, run at 1,500 r.p.m., driving 25-cycle three-phase generators of 20,000 kw. each, at 11,000 volts. The three generators combined have a two-hour overload capacity of 70,000 kw. The installation occupies a floor space 52 by 50 ft., and introduced new problems in piping and foundations. The automatic-governing arrangements are unusually complete.



Generator End of the Big Turbine Unit, Showing the Similarity of the High and Low-Pressure Elements: The Stacks on the Generators Are Outlets for the Air Used in Dissipating the Extreme Heat Developed in These Enormous Engines



High-Pressure Cylinder of the 100,000-Horsepower Turbine: The Two Low-Pressure Elements Are Just beyond It, and Above is Seen the Massive Piping Which Connects Them. In the Distance Are Smaller Units Previously Installed



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Vista down the Great New York Power House Where the New Turbine is Installed: It Appears at the Center of the Picture, Distinguished by the Air Stacks on Its Generators. Smaller Units Occupy the Foreground

**At the Left Is Visible Part of One of the Old Flywheel Generators, Driven by Reciprocating Engines. Imposing as It Appears, This Unit Develops But 7,500 Horsepower. Compare It with the New Unit Just Beyond**



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## BLASTING A MASSIVE VAULT ON A BUSY CITY STREET

Blasts of dynamite were used within a few feet of plate-glass windows and persons at work, without an accident and with entire success, in a recent operation for the removal of the vault in a vacated bank office on a busy city street. The vault, of brick set in Portland cement, was 14 by 12 ft. by 7½ ft. high; the walls 20 and the ceiling 30 in. thick, the latter being supported by 12-in. I-beams. Holes were bored in the walls, about 18 in. from the free ends, and light charges fired to take off small fragments at a time. The bore holes, as well as neighboring windows, were protected by boarding and canvas.

These Remaining Fragments of the Old Bank-Vault Wall were Readily Broken Up for Easy Handling by the Use of Small Charges of Dynamite

## HIGHWAYS OF THE AIR MAPPED FOR U. S. AND CANADA

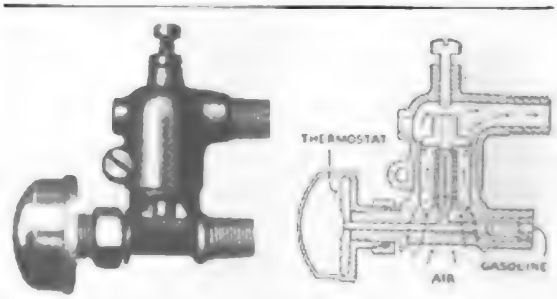
In an effort to safeguard and popularize air traffic, a recent Pan-American Aeronautical Congress suggested the recognition of official "airways" and "air routes." In the proposed regulations, a distinction is made in the use of terms, an "airway" being defined as a path or belt, 80 miles in width, stretching across the continent or along the coast. An "air route" will be but half as wide, and will be used to connect the more important "airways." Eight of the latter are proposed for the United States, five transcontinental and three coastal.

## SCIENTIST DENIES MOTION OF ELECTRONS IN ATOM

Theories about the electrons, which are the components of the chemical atom, are always difficult to verify by experiment. The atom itself is about one hundred-millionth of an inch in diameter; yet it dwarfs the electron as the dome of the national capitol dwarfs a pinhead. Despite the difficulties of work with such infinitesimal units, one scientist has completed a series of experiments which are expected to change the whole viewpoint of chemistry. In place of the old assumption that the chemical atom is a group of electrons in rapid orbital motion, he declares that the electrons are stationary, and are arranged in three dimensions, and in patterns of geometrical form. Proceeding directly from this assumption, he has tried to account for the nature of various substances by studying the arrangement of the electrons in the various atoms. He has even gone so far as to state that the atoms of inert gases, like helium and argon, are stable and exist in the form of a four-sided prism with one axis elongated.

## WATER VAPOR FED TO MOTOR BY THERMOSTATIC VALVE

Automobile motors run best on damp days. To provide automatically the right degree of moisture at all times, and at the same time prevent the formation of carbon, a western inventor supplies a small




The Thermostatic Valve Regulates the Moisture Supply, as the Diagram Indicates

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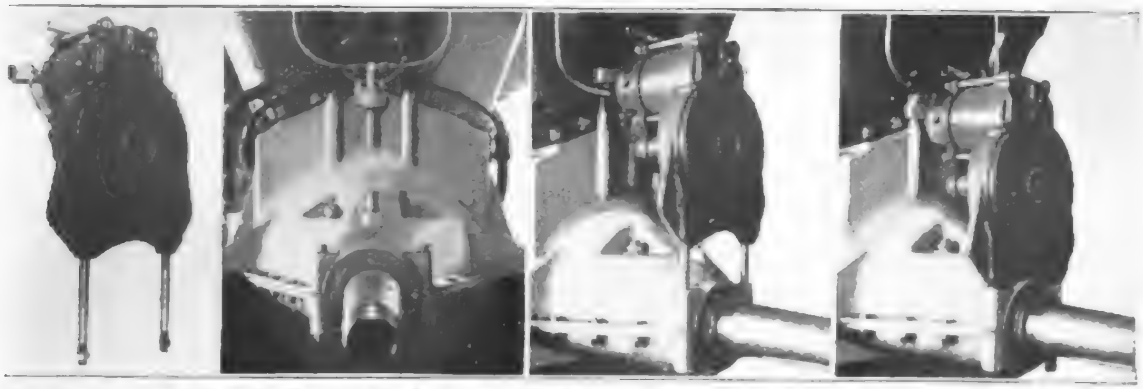


Electric Starters Like the One on the Left were Used on Many Navy Seaplanes during the War. The Next Picture Shows the Front End of a Liberty Engine with the Propeller Removed. The Third View Illustrates the Ease with Which the Starter is Fixed to the Crank Case, While, at the Extreme Right, It is Shown in Place

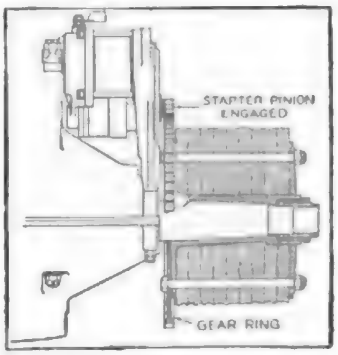
valvular device which taps into the water jacket of the cylinder or carburetor. An inclosed thermostatic diaphragm operates the water inlet according to the heat of the engine. The entire device is only 2½ in. high.

## CARRY FARM-LIGHTING OUTFIT IN PORTABLE BUNGALOW

Electric-lighting systems for farmhouses not only are demonstrated at the farmer's door by an Indiana dealer, but a real house is taken along to show how the outfit works in practice. The idea of mounting an imitation dwelling on a motor-car chassis has been worked out with unusual attention to detail, presenting the half-size replica of a dainty bungalow. The operation of the lighting plant is thus seen by the prospective buyer as he would use it. The demonstration equipment, which cost about $3,000, attracts a great deal of attention.

## ELECTRIC STARTER SUPPLIED FOR NAVAL SEAPLANES

With the removal of the veil of wartime secrecy it becomes possible to describe the electric starter with which many of our naval seaplanes are equipped. The mechanism is essentially a small electric motor, fitted with a double gear reduction and an automatic gear shift. As attached to the Liberty motor, it is bolted to the crank case, just behind the propeller, in space that would otherwise go to waste. The attachment is easily accomplished,



The Back Door Stands Invitingly Open, and from This View the Little Bungalow Reveals Only Its Demonstration Lighting Equipment, and Scarcely Looks Like a Motor Truck. On the Road, Its Appearance is Equally Attractive as may be Judged from the Right-Hand View

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involving no alteration to the engine, but simply the manipulation of four bolts, and the mounting of a gear ring inside the propeller-hub flange. Then, to start the engine, a switch is depressed, the starting pinion emerges, meshes with the gear on the propeller, and cranks the engine at 40 to 50 r. p. m. As the engine starts up under its own power, the gears are automatically unmeshed, thus severing all connection between starter and crankshaft.

These starters were used on the navy's transatlantic machines, both the "Nancies" and the ill-fated "blimp."

## INTERPHONE HELMETS USED IN AIR SERVICE

Equipped with the interphone helmets now used in the new wireless air service

**An Interphone Helmet is Here Seen Disassembled to Show Its Inner and Outer Shells**

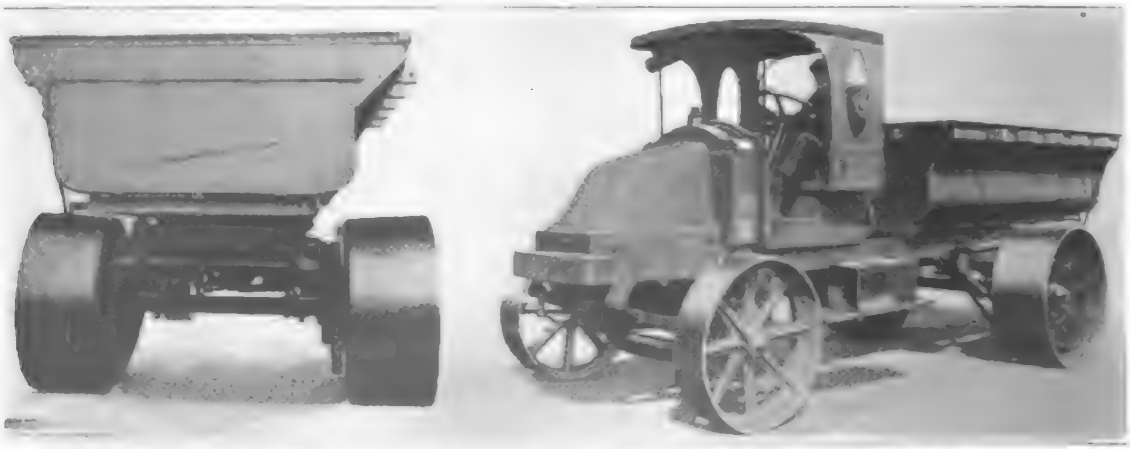
of the United States, all the airmen of a squadron can converse during a flight. The helmets are made of hair felt, like that used in piano hammers. The finished helmet consists of an inner and an outer hood, or "Russian" hat, the two separated by an air space. Through holes in the inner hood at the ears the phone receiver is inserted, and over this the outer hood is stretched. The leading-in wires are sealed in the outer hood, and all is tight as a drum. This air-tight feature combines with the air space to make the helmets impervious to cold.

## WIND HELPS BUILDERS MAKE SAND ROADS

A new method of using the wind in sand-road construction has proved so successful, that, after making a nine-mile experimental stretch in New Mexico, road makers in that state have built 80 miles of similar highways. First of all, the grass and weeds are cleared from the right of way, and then a trench is made through the sand to the clay bottom. The loose sand is deposited in stacks 10 ft. from either side of the cut, and the rest of the work is left to the desert winds. During the spring and fall, the winds sweep away all the sand and widen the clay strip. Then the road is graded and the work finished.

## BROAD STEEL-TIRED WHEELS ON CONSTRUCTION TRUCKS

To prevent damage to new roads by the heavy road-building trucks themselves, the vehicles are being equipped with flat steel tires of great width, riveted to cast-steel wheels. These wheels, interchangeable with regular equipment, are being produced in large quantities to meet the season's unusual activities in road construction. A five-ton truck, weighing loaded some 20,000 lb., leaves little impression on the softest of roads when equipped with such tires.



**These Broad Steel Tires have been Designed to Facilitate the Season's Remarkable Road-Building Activity. Fitted with These Wheels, the Road-Building Trucks can Themselves Travel over the Soft New Roads, Enabling the Crews to Progress at a More Rapid Rate**

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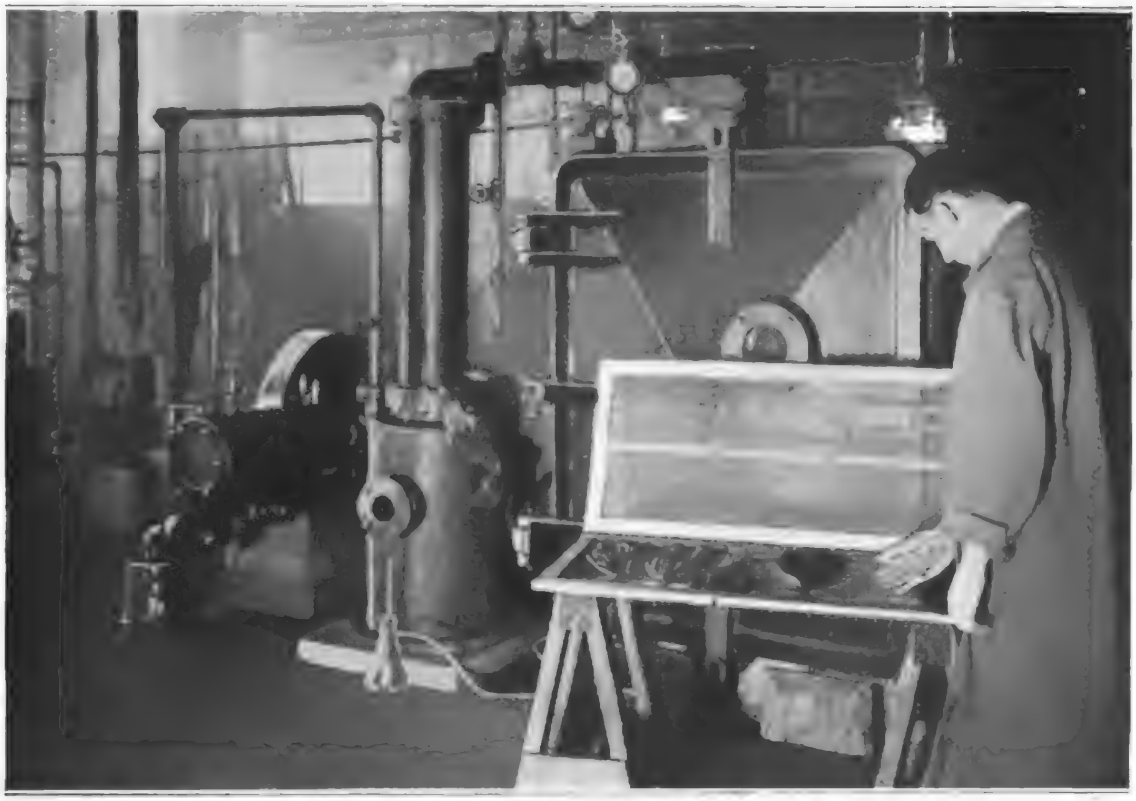
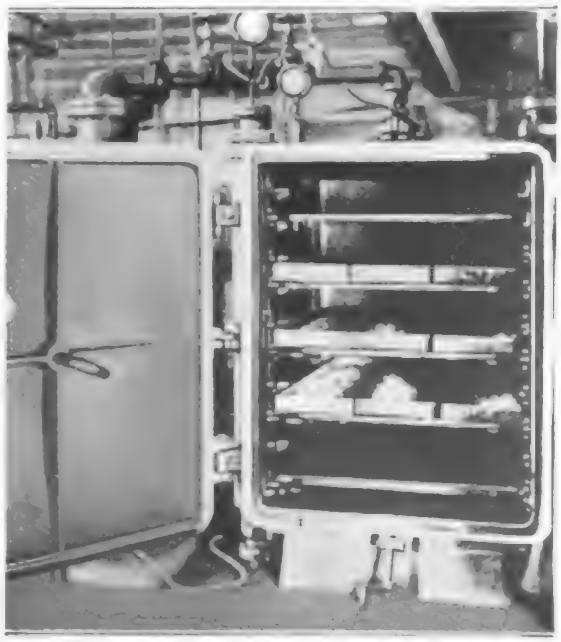


General View of Columbia University's Dehydrating Plant: The Operator is Examining Specimens of Cod and Mackerel Which have Just been Dried between the Frames of Wire Netting, the Latter Keeping the Product Flat and in Shape for Economical Packing

# VACUUM PROCESS OF DEHYDRATION PRESERVES MEATS AND OTHER FOOD

ALTHOUGH the preservation of food by drying is an old art, it was not until recently that the problem of food dehydration received any serious scientific study. As a result of many experiments, here and abroad, we are now in possession of enough facts to enable the development of the food-drying art into an industry of large proportions. There have appeared on the market preparations of dehydrated vegetables produced by some air-current system in which the cut vegetables are heated in a current of warm (dry or moist) air until the product is considered dry enough to keep. The results of this type of vegetable dehydration are quite well known. It must be noted, however, that the air-current system has two marked disadvantages. First, it is uneconomical, wasting about three-fourths of the fuel employed; and, second, it is not applicable to a variety of products, the most important of which is meat. We are familiar with South American jerked beef and air-dried fish. Those who have tasted either of these will realize the difference, in flavor and appearance, between them and the fresh product. The necessity for



Vacuum-Drying Oven, Open, with Five of a Possible 12 Shelves in Place, and Three in Use: By Adjusting the Degree of Vacuum, Water may be Boiled at 100 Degrees



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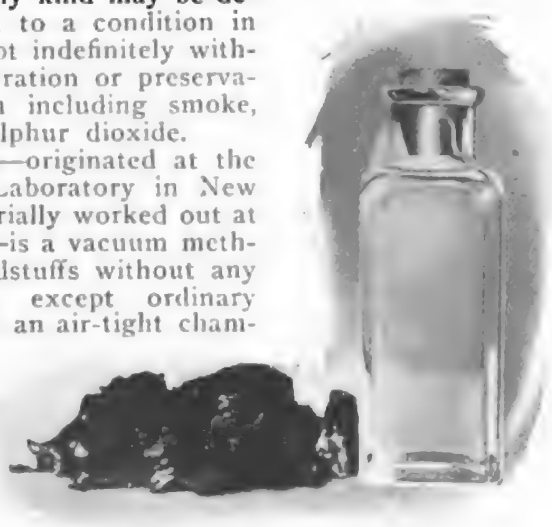
further development in dehydration of these products and the need for a more economical system was clear.

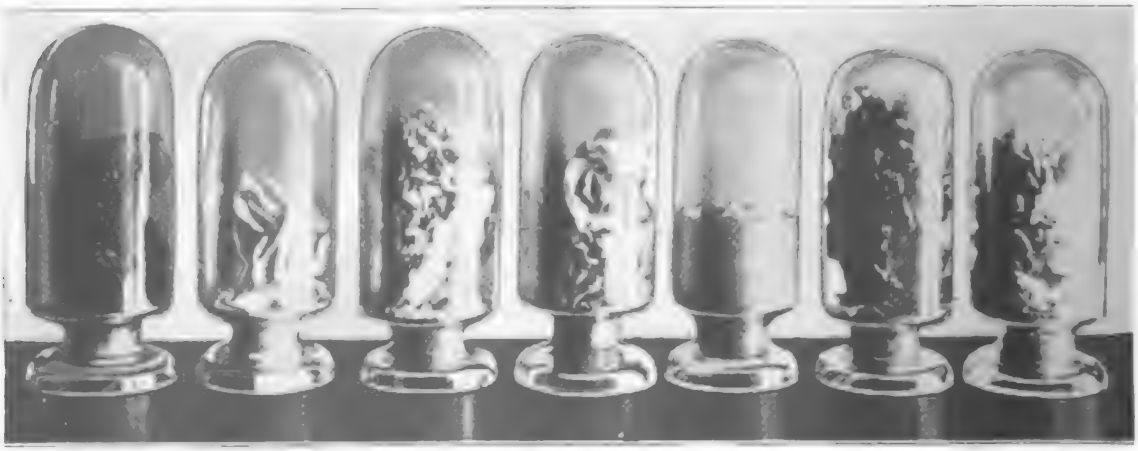
The task of evolving a process and developing a product suitable for use in the field was assigned to Drs. K. G. Falk and E. M. Frankel by the surgeon-general. In this they were successful, and there is now available for public use a method by which foodstuffs of any kind may be dehydrated and reduced to a condition in which they can be kept indefinitely without the use of refrigeration or preservatives, the latter term including smoke, salt, saltpeter, and sulphur dioxide.

Briefly, the process—originated at the Harriman Research Laboratory in New York City, and industrially worked out at Columbia University—is a vacuum method, in which the foodstuffs without any previous preparation except ordinary cleaning are heated in an air-tight chamber, from which the air and other gases or vapors are exhausted. Under these conditions the water in the food product, which ordinarily boils at 212° F., can, by proper adjustment of the vacuum, be made to boil at 100° F. Thus, the foodstuff is never overheated, and no coagulation of protein materials or other changes induced by high heat are brought about. As a result of the low temperatures employed, the volatile aromatic oils which give most vegetables and fruits their characteristic tastes, are retained. In contrast to the air-current system, drying in vacuum takes place from within the mass rather than from the surface, so that the outside of the pieces of food is not made tough and sometimes impermeable to water, as is the case with air-dried products. Again, many articles of food cannot be dehydrated in a current of air because of their tendency to darken unless they are treated beforehand to prevent discoloration. Thus, for instance, potatoes, both sweet and white, must be steamed first, while apples and other fruits must be impregnated with sulphur dioxide before drying. With the vacuum method it has been found unnecessary to resort to any of these preliminary treatments. Similarly, in the dehydration of meat and fat fish, it is possible, due to the absence of air, to preserve the fatty components without any tendency to rancidity.



The Bottle at the Right is Full of Water Extracted by the Vacuum Process from the Dried Beef at the Left

From the standpoint of cost, the new process leaves little to be desired. Despite the relatively high initial expense for the vacuum chambers, which must be built of fairly heavy metal, the operating cost is so much lower than those in any other dehydration system that the higher investment is soon repaid. The best practice in air-current systems involves a coal consumption of nearly four times that in the vacuum system. The power employed in maintaining the vacuum in the drying chambers



Bottles Containing Samples of Various Products Which have been Dehydrated by the Vacuum-Oven Process: In Order from Left to Right, the Specimens Are Tomatoes, Potatoes, Cabbage, Carrots, Ground Meat, Stew-Pieces of Beef, and Turnips

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represents a very small item, since the exhaust steam is used as the source of heat for the drier. On the whole, the cost of drying meat is about equal to that of refrigeration, but since the expense ends with the drying, while each day of holding untreated food increases refrigeration expense, the economy of the method is apparent. A fair estimate of average cost is one-half to one cent per pound of fresh material.

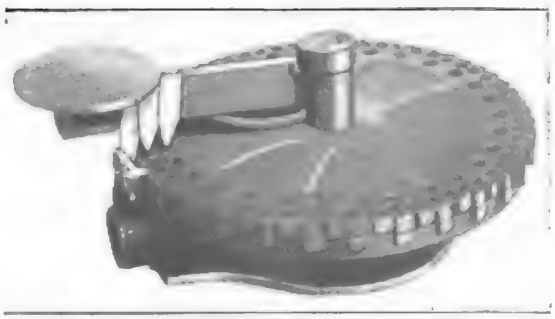
The construction of the drier is relatively simple. In the main it is a chamber with cast-iron walls and doors, the joint between the doors and chamber being made air-tight with a rubber gasket. The interior of the drier is filled with a series of hollow shelves in which warm water, or low-pressure steam, circulates. The foodstuff to be dried is cut into suitable sizes, preferably less than an inch in thickness, and spread on metal trays which rest on the warmed shelves. After charging the drier, the chamber is closed, the vacuum applied, and the heating begun. Evaporation starts almost immediately, the length of time in which the process is completed, of course, depending on the thickness of the material and its nature. Thus, slices of meat, one-fourth inch thick, may be dried in less than two hours, while one-inch steaks require about 10 hours for complete drying.

The Machine at the Left Is the Vacuum Pump; in the Center Is the Condenser, and at the Right the Vacuum Oven. The Source of the Heat Used Is Exhaust Steam, and the Operator is Seen Regulating the Supply

The national economy that may be effected by food dehydration must not be overlooked. In the past, drying of food has been contingent on hot sun and favorable weather in general. Too warm or damp weather, flies and other insects, etc., all combine to make open-air drying a precarious method. Drying in artificial warm-air currents is expensive and irregular, and cannot be applied to all materials. Vacuum drying alone meets the needs of all foodstuffs and combines regularity and reliability with low-operating cost. Especially as applied to meat, vacuum drying is economical, since it permits the complete utilization of excess fat, bones, and other products at the packing house, where their maximum value can be realized; and so presents an opportunity for the reduction of food prices to the ultimate consumer.

## ORCHESTRA "GUN" SHOOTS BY FOOT PRESSURE

The theater orchestra's busy trap drummer, required on occasion to produce all known sounds, may now interject his battle-scene or hold-up interpretations with single shots, or volleys, without moving a finger. One of the fraternity has devised a "gun" which shoots by foot pressure. Its wheel-shaped cylinder holds sixty .22-caliber and thirty .32-caliber cartridges, which may be fired singly, alternately, or the two sizes together, the latter making the report of a .41-caliber. A particularly realistic flavor is thus added to motion-picture accompaniments.



"Gun" for the Use of Orchestra Trap Drummers, Which Fires by Foot Pressure: The Chambers Hold Sixty .22-Caliber and Thirty .32-Caliber Cartridges

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Hot, Appetizing Food was Rushed to the American Lumberjacks in French Forests Each Noon, on Railway Speeders Cut Down to Narrow Gauge. Leaving the Permanent Camp a Few Minutes before Mess Call, the Little "Gravy Trains" Reached the Most Advanced Cuttings Promptly

## "GRAVY TRAINS" RUSHED FOOD TO AMERICAN LUMBERJACKS

The American lumberjacks who cut wood in French forests for the A. E. F. were an uncommonly husky bunch. Among other things, they liked lots of "chow," and they liked it hot. The cooks found it easy to satisfy them at breakfast and supper, but the midday meal was at first a harder task. The men were usually well into the timber by noon, and often in country far too rough for motor trucks. However, gasoline railway speeders solved the problem. Cut down to narrow gauge, they were run from the mill yards to the cuttings each noon, bearing hot, appetizing food. A few hungry cutters sometimes failed to hear the noisy approach of the "gravy train," but no lumberjack was ever known to miss the cook's final summons, for when that dignitary rose and belabored the battered old coffee can with a monkey wrench or other handy tool they always came in on the run.

## FLOATING TOOL HOLDER REDUCES FRICTION

To reduce friction in reaming operations a floating tool holder has been designed in which the use of steel balls gives a rolling movement to the various parts. Four balls are set in grooves at right angles, the grooves being cut in the ends of the shank and socket, as well as in each side of a centerpiece. This allows room for both an axial adjustment and a swiveling movement. The weight of the shank is supported by a spring.

## SMALL, LOW-PRICED BIPLANE TO APPEAR ON MARKET

Four army lieutenants, stationed at a Texas flying field, have designed and supervised the construction of a biplane that weighs only 450 lb. The two-cylinder motor generates 15 hp., and the wing span is but 15 ft., yet the little machine reaches a maximum speed of 75 miles an hour. Making only a few changes in the original machine, the lieutenants intend to use it as the model for a commercial plane which will sell for about $1,000. Small planes of this type will recommend themselves to many, as they can land in a country road, be carried intact on a motor truck, and kept in ordinary garages.

This Little 15-Foot Biplane was Designed by Four Army Airmen and Constructed under Their Supervision in the Shops of the Air Service. The Designers Intend to Construct Similar Planes for Popular Use

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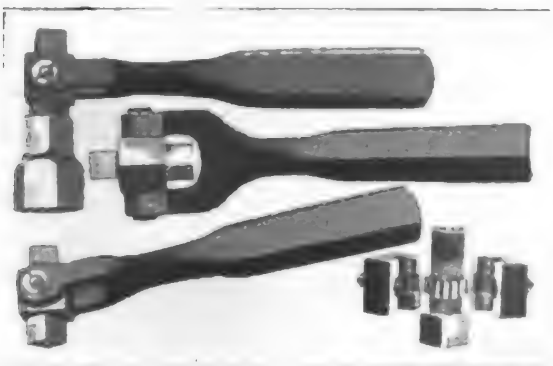
## AMERICAN SHIPYARDS OPENED TO FOREIGN CONTRACTS

Large orders are expected from France, Italy, and Norway as a result of a recent presidential order permitting American yards to receive foreign contracts for steel ships, in so far as that can be done without interfering with the construction of our own merchant marine. In this connection the Shipping Board announces that only a few American yards are now in a position to accept such contracts, but that the situation will gradually be relieved. Despite their proximity to English shipyards, the three nations mentioned are so urgently in need of ships that an estimated total of 3,000,000 gross tons may be ordered in American yards under the provisions of this ruling.

## RATCHETED SOCKET WRENCH FOR TIGHT CORNERS

A socket wrench of a type recently patented is often convenient for work in the cramped corners sometimes encountered about an automobile, tractor, or machine. In this case, a ratcheted head is mounted in a socket. The socket is pivoted between the arms of the shank, or handle, on two trunnions, which at the same time act as pawls for the ratcheted head. Two extension bars further increase the usefulness of the appliance.



**Interest in This Socket Wrench Centers in the Combination Pawl-and-Ratchet Action, Which may be Understood from the Disassembled View**

## TRACTOR-DRAWN DRAG KEEPS ROADS IN GOOD SHAPE

Country roads around Maryville, Mo., —500 miles of them, at least—have been in good condition since the first of the year. Credit for that fact goes to the use of a heavy drag hauled by a farm tractor. A cutter blade in front levels the road, and a massive float in back breaks the clods and smooths the surface.

**Use of a Tractor for Hauling Permits Road Dragging to be Done with a Heavy Special Drag, Having a Leveling Cutter in Front and a Massive Smoothing Float in the Rear**

## WIRELESS MUSIC ENTERTAINS MEN ON SHIPS AT SEA

Like all well-regulated ships, the transport "George Washington" has a phonograph. It also has wireless-telephone equipment of the latest design. On a recent occasion the phonograph horn and the telephone transmitter were brought face to face, and the music started. A hundred miles away, soldiers and sailors on the transport "President Grant" gathered eagerly around a loud-speaking receiver, from which issued the merry strains of song and fox trot, as the concert ship threw its melodious vibrations into space. Within the hundred-mile radius were several other radio-equipped ships, and when the concert was over the "George Washington's" operator was kept busy receiving encores.

¶After more than four years' service as an important military wireless station, during which no civilians were allowed to visit it, the Eiffel Tower in Paris, France, has been reopened to the public.

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# REPLANTING WAR-SWEPT FRENCH ORCHARDS

This French Family Garden is Getting Some New Apple Trees, Which the Government Nurseryman is Helping to Plant. The Garden has been So Carefully Restored That It would Show Little Sign of War but for the Ruined Building at the Back

With a Shell-Damaged Barn for a Background, the Government Expert and the Farmer are Planting a New Sapling to Take the Place of the Destroyed Tree Lying on the Ground

Forests and orchards in the devastated regions of northern France, mowed down by artillery fire or willfully destroyed by the retreating Huns, are being restored as rapidly as experts from the nurseries of the French government can accomplish the task of blasting out the dead trees and stumps. The entire expense of this work, as well as that of supplying and planting the new trees, is borne by the government, as it is considered of national importance that the farmers receive all possible encouragement to resume their industry.

## PRIZE FOR NONSTOP FLIGHT FROM NEW YORK TO PARIS

In an effort to unite more closely the aeronautical interests of the United States and France, the land of his birth, a prominent New York hotel man has offered $25,000 to the first airman of any allied nation who crosses the Atlantic in a nonstop flight from Paris to New York, or from New York to Paris. Aside from the

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stipulation that the trip be made within the next five years, all details and conditions will be left to the Aero Club of America, under whose auspices the donor hopes the flight will be made. The distance between the two cities is a good deal more than twice as long as any flight yet made by an airplane; but the donor is confident that the science of aviation will continue to develop during the next five years, and in consequence feels certain that his prize will be claimed.

## LIFT DOORS OF UNUSUAL TYPE FOR FACTORY ENTRANCES

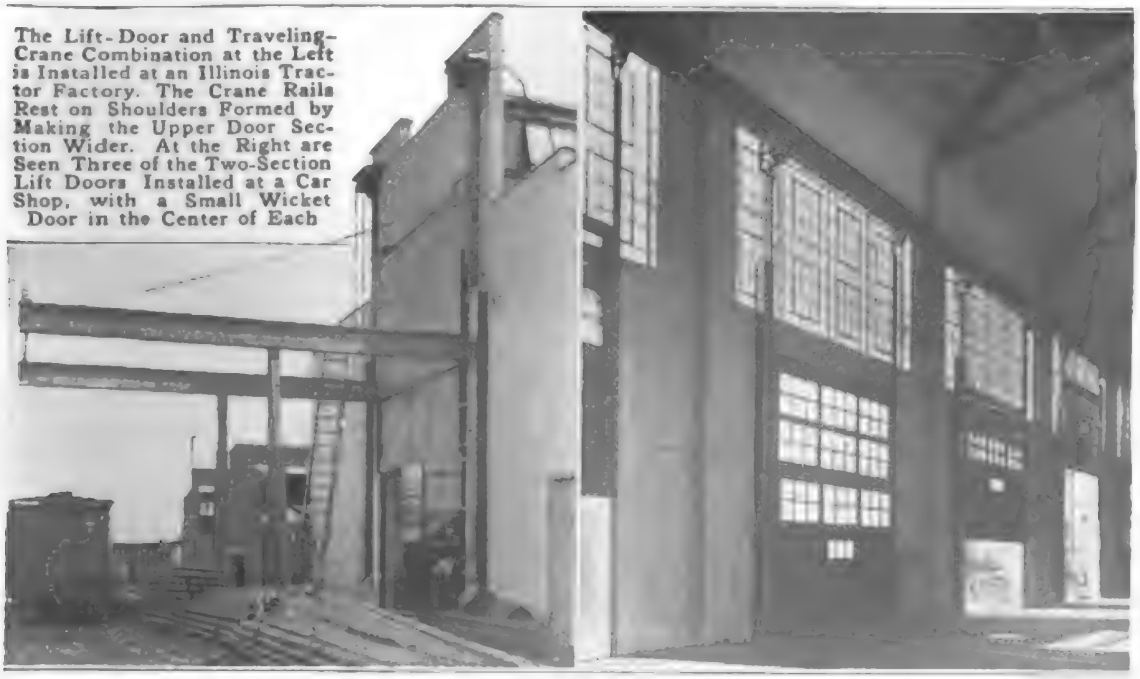
An Illinois tractor factory is now taking in its raw material through a doorway of unusual design, with a considerable gain in facility. The entrance, 24 ft. high, is closed by a huge lift door in two sections, the upper 19 and the lower 16 ft. wide. On the shoulders so formed, halfway up, rest the rails of an overhead crane, extending out above a switch track. The lift-door sections, together weighing over a ton, are so counterbalanced as to be operable by a hand chain at the side, the lower section lifting twice as fast as the upper. Doors of similar type, but without cranes and all of uniform 12-ft. width, have been installed to the number of 21 in a large railway shop in Illinois. These doors, some 16 and some 18 ft. high, are 2⅝ in. thick, and in the center of each is a small wicket door.

## HANDCUFFED TO BICYCLES, TWO JACKIES CROSS CONTINENT

Handcuffed to their bicycles, two jackies are pedaling across the continent from Venice, Calif., to New York. When

**Two Sailors from California, Tied to Their Bicycles by Handcuffs Which Cannot be Unlocked Until They Reach New York: Even the Keyholes are Sealed**

the handcuffs were locked the keys were mailed to New York and the keyholes sealed; these must be intact upon arrival at the end of the journey, which will require five months. The idea is to stimulate navy recruiting, and the boys will reenter the service. They are handcuffed to eliminate all suspicion of getting a "lift" while en route, from autoists or on trains. They expect to sleep with their wheels and to have their company at meals.



The Lift-Door and Traveling-Crane Combination at the Left is Installed at an Illinois Tractor Factory. The Crane Rails Rest on Shoulders Formed by Making the Upper Door Section Wider. At the Right are Seen Three of the Two-Section Lift Doors Installed at a Car Shop, with a Small Wicket Door in the Center of Each

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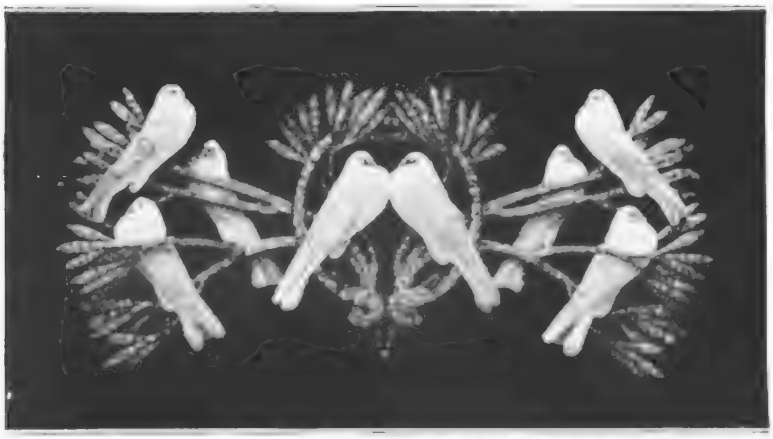
## JEWEL OF UNRIVALED BEAUTY ADORNS FIRST LADY OF LAND

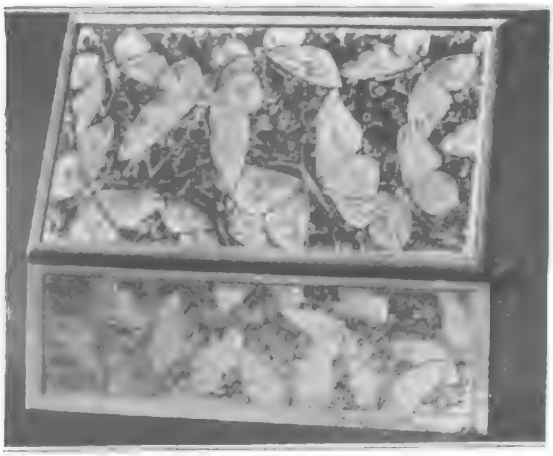
The elaborate corsage pin presented to Mrs. Wilson by the people of Paris is intended to symbolize the peaceful mission of the presidential party. Hence the most striking element of the design is the group of eight doves formed of white translucent enamel, against a backing of burnished gold which reflects the light in a suggestion of the undulating move-



PHOTOS BY COURTESY OF THE JEWELERS' CIRCULAR

**This Corsage Pin, Presented to Mrs. Wilson by the People of Paris, Is the Work of a Celebrated French Master Craftsman. The Eight Doves are Made of Translucent Enamel on a Background of Burnished Gold**

ments of actual life. The faultless little figures perch gracefully on interwoven, diamond-studded olive branches. The



**This Casket is Acclaimed by Many as Even More Beautiful than the Jewel Which It is Intended to Hold. The Top and Sides are Formed of Engraved Glassware**

whole piece is undoubtedly beautiful in design and execution; yet many of the artist's fellow craftsmen have more praise for the case intended to hold it. This box is built on a metal frame, in which are set panels of glassware engraved with butterflies on a dainty lacework of leaves and branches. These glass panels are worth particular attention, as the artist has devoted many years to this ancient craft of melting and molding glass into exquisite designs.

## NEW ENGINE DRIVEN BY BOTH GASOLINE AND STEAM

By utilizing the heat energy which ordinarily goes to waste in the exhaust gases and water jacketing of a gasoline engine, a new British engine is reported to show a remarkable increase in power, accompanied by an actual decrease in fuel consumption. Fully 50 per cent of the thermal energy, ordinarily wasted, is recovered in this way, and used to produce steam. Piped to ports in the bottom of the cylinders, this steam is expanded against the backs of the pistons, causing an obvious increase in power, and even enabling the engine to handle large overloads for short periods. In a recent report on the performance of this new engine, an expert is quoted as saying that it is nearly 10 per cent more efficient than the famous Diesel engine, now considered the best of the several internal-combustion types.

## ONE VARIETY OF SUGAR CANE IMMUNE TO TROPICAL DISEASE

In response to a request from Porto Rican authorities, a scientist was recently dispatched to the island by the U. S. Department of Agriculture for an investigation of the "mottling" sugar-cane disease, called "mosaic," which threatened the entire industry. Selecting 90 varieties of cane, the investigator planted them, exposed them equally to the ravages of the disease, and several months later studied results. He found that, of the 90 varieties, only one, a Japanese plant called "kavangire," was unaffected and apparently immune. So Porto Rican planters are now watching with the keenest interest the further experiments with this variety. If it retains its immunity under test, and proves adaptable to local conditions, they realize that the fight against the dreaded "mosaic" is won.

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## FOREST BIOLOGICAL STATION MEMORIAL TO ROOSEVELT

As a memorial to Theodore Roosevelt, a forest biological station, devoted mainly to the study of wild-animal life, has been established at the New York State College of Forestry, Syracuse University. This station is believed to be the first of its kind to be established in the world. It is considered to be of great importance to foresters and zoölogists, though it is a project in which many simply interested in the conservation of wild life feel concerned. A better knowledge of all kinds of wild animals, birds, and fish is necessary, according to authorities, to enable lawmakers to pass suitable legislation for the protection and conservation of game. The idea of the biological station received the indorsement of the ex-president before his death. Funds furnished by the state of New York will support the station, though it is expected that donations from private sources also will be received.

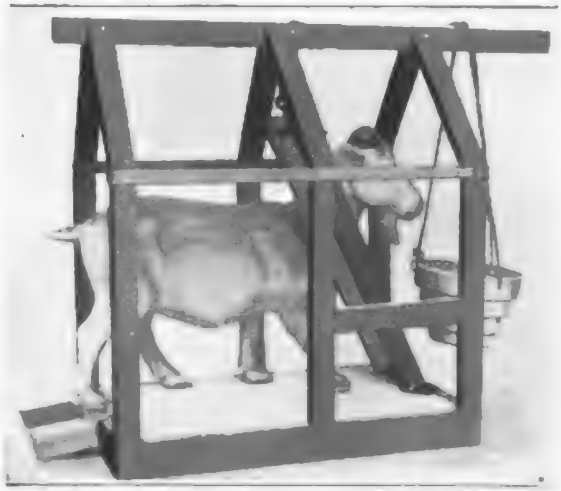
## MOTORCYCLE-SIDECAR TAXI CARRIES TWO PASSENGERS

A curious type of two-passenger taxicab is being introduced in England, where its relatively low rates of fare promise to bring it considerable popularity. The cab itself is a motorcycle sidecar, with two separate seats, a windshield, top and curtains, and easy springs. The driver, of course, remains out in the open, at his post on the motorcycle.

Top, Windshield, Curtains, and Separate Seats Give This Motorcycle Taxicab Most of the Comforts of the More Familiar Type

## MILK GOAT EASILY KEPT IN BACK-YARD STALL

One city dweller has found it possible to keep a milk goat on his property by constructing a small, movable stall in which the animal lives comfortably in any corner of the back yard or basement. From a light framework he suspends a yoke which incloses the animal's neck, and also a little basket manger.



Wood and Concrete Are the Materials Used in the Construction of This Little Stall, by Means of Which a Milk Goat may be Kept in an Odd Corner of Back Yard or Basement

## GOVERNMENT SHIPPING BOARD OFFERS VESSELS FOR SALE

The centrifugal force that is rapidly scattering the cast-off machinery of war was evidenced in the sale, recently, of four—or, to be accurate, three and a half—steel vessels by the United States Shipping Board. The "Charles R. Van Hise," at Buffalo; the "Frontenac," with its forward portion at Erie, Pa., and its stern at Dalhousie, Ontario; the "Blue Hill," and the stern portion only of the "Manola," at Ogdensburg, N. Y., were all knocked down "as is" to selected bidders. The bids were sealed, conditions being of the usual form. The ships ranged in size from about 2,000 to over 5,000 approximate gross tons.

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## MEALS KEPT WARM IN TRANSIT IN INSULATED RACK

The pleasure of eating a meal in one's hotel room is usually mixed with disappointment on discovering, from the temperature of the food, that the waiter has stopped to snatch a few minutes' sleep on his way from the kitchen. But now he may sleep an hour, thanks to a movable table used in one hotel. In the kitchen the dishes are placed on the shelves of an asbestos-lined compartment under the table top. Rolling easily on its rubber-tired wheels, the table is pushed to the guest's room, temperature being maintained meanwhile by glowing charcoal bricks held in a drawer beneath.

Meals are Rolled from the Hotel Kitchen to the Guest Room in the Insulated Rack beneath This Little Table. A High Temperature is Maintained by Charcoal Bricks Contained in the Drawer Seen at the Bottom

## SIDEREAL AND SOLAR TIME ON ONE POCKET CLOCK

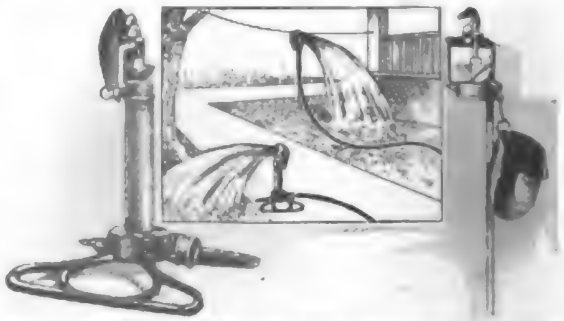
A clock with four dials, yet small enough to be carried in the pocket, and reading simultaneously in both mean solar and sidereal time, has been designed by a Danish astronomer and engineer. Two of the dials are for the two kinds of hours. The dial for minutes has two hands, one making 366 revolutions while the other makes 365. The seconds dial is for mean time only. Either set of hands may be adjusted to local time or that of any meridian desired. Seamen, astronomers, and geodetic surveyors will find the new timepiece particularly useful.

## CEREBRAL CONGESTION SEEN AS CAUSE OF STAMMERING

Stammerers and their friends alike should be interested in the conclusions recently announced by a psychologist, at the close of a long series of experiments on both normal and affected individuals. He has come to believe that the fear of stammering, just like mental shock or fright, causes a rush of blood and consequent congestion of the brain areas, particularly of those governing the function of speech. He calls attention to persons struck dumb by intense fright, and to inexperienced public speakers who have completely forgotten their text in a moment of panic. Similarly, he says, when the stammerer attempts to speak, his very fear that he will stammer causes cerebral congestion, and a consequent blurring of verbal imagery. For example, knowing that a word contains a consonant or vowel which he pronounces with difficulty, the stammerer begins to fear that consonant or vowel, the speech areas of his brain become clogged, and he pronounces imperfectly or even forgets the sound he wishes to articulate.

## SPRINKLER SPRAYS LAWN IN EVEN HALF CIRCLE

It is possible to spray a lawn thoroughly, and still retain the good will of neighbors and passers-by, with a new



The New Lawn Sprinkler is Shown in Two Forms. A Brass Deflector Plate, on Both Models, Distributes the Water Evenly over a Half Circle

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No Man's Land Was Never More Desolate than These 20 Square Blocks in Mobile, Alabama. For Four Hours the Blaze Was Master of the Town

The Housing Problem Was a Difficult One for Mobile, Even before the Catastrophe. With the Destruction of 200 Homes It Becomes the City's One Interest

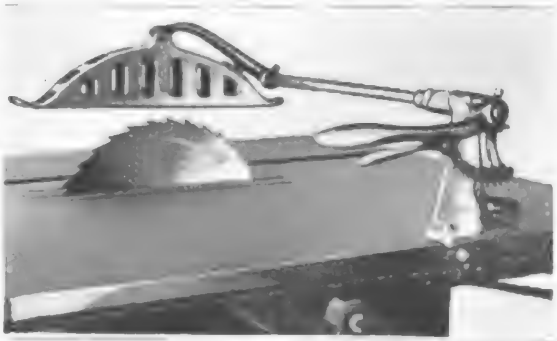
sprinkler that distributes the water evenly over a half circle. A removable brass deflector plate controls the shape of the spray by covering one side of the spinner, which turns freely on a steel ball against the end of a brass rod. One form is made with an iron base, another with a pointed ground rod. By means of a hook at the top, the sprinkler may be slid along a taut wire for spraying large lawns or gardens. With the spinner removed, it throws a solid stream, and may be handled like an ordinary hose nozzle.

## HUNDREDS OF WOODEN HOUSES VANISH AS FLAMES ROAR

Fire originating at 3:30 p. m. in a backyard rubbish heap in Mobile, Ala., recently stole along a board fence, ignited a wooden dwelling, and before anyone realized the seriousness of the situation, had roared its way through the crowded neighborhood. Gathering speed among the tinderlike little pine cottages, it jumped street after street, until 20 square blocks had been swept clean. During the first hour the fire department labored almost unassisted, as the males of the families were away at their daily work; but as the dismayed city saw the smoke roll higher and higher, employes were released from shops and offices, until 20,000 men were fighting for their homes. Yet the blaze swept where it would until 7:30 in the evening, when the changing wind blew it back upon itself. Representatives of relief organizations at once picked their way through the smoldering district, and counted 200 brick chimneys as the sole remains of as many houses.

## GUARD ABOVE CIRCULAR SAW SAVES WORKMAN'S FINGERS

If there is one thing more dangerous than dynamite, mill owners believe that it is a high-speed circular saw. It is improbable that the latter will ever be made completely harmless; but a step in the right direction is made by a new adjustable guard. Primarily a cap for the exposed section of the whirling blade, it is so hung from a movable arm that it may be raised or lowered to barely clear the lumber being cut. Or it may be dropped completely over the blade when the latter is running idle on a direct line shaft.



This Circular Saw Has a Guard, or Cap, Which May be Raised or Lowered

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SCRAP IRON AND KINDLING WOOD MUTE EVIDENCES OF LOGGING TRAIN'S TRAGIC RUNAWAY

FAILING to realize the tremendous momentum which urged his 12 logging cars down a Washington mountain side, the engineer whistled too late for "brakes," as he approached the sharp curve at the foot of the grade. The "brakies" tugged at their wheels; but the little cars rolled toward destruction with increasing speed. Preferring injury to helpless death, the brakies jumped as the doomed train hit the curve, and was derailed. They found the engineer dead in his cab, and his fireman fatally hurt.

## VALLEY OF 10,000 SMOKES BEING STUDIED AGAIN

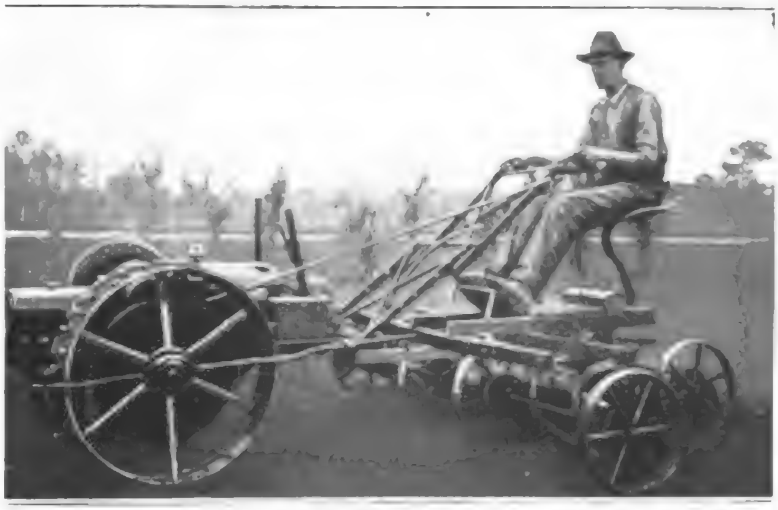
Several expeditions have already penetrated the Valley of Ten Thousand Smokes on the Alaska Peninsula, just north of Kodiak Island. On their return, these parties have rendered reports that are almost unbelievable, although substantiated by many photographs. Here elemental nature has her workshop. From innumerable fissures and craters, large and small, rise jets and curtains of charring steam and odorous gases. Hillsides crumble and fall with a roar, as the volcanic forces disintegrate the rocky masses. And now the weird valley is being studied again, this time by a group of specialists, including a chemist, a petrographer, a zoölogist, and a motion-picture photographer. The report of the chemist is awaited with particular interest, as he is testing the fissures for helium, the non-inflammable gas which promises to revolutionize the science of ballooning.

## PAINTED BACKGROUNDS PLACED BEHIND RAILROAD SIGNALS

Locomotive engineers on a western railroad complained that several semaphore block signals on their runs were difficult to see from a distance against the green forest background. Others were hard to distinguish against the blinding light from the morning or evening sun. To remedy these conditions the company is experimenting with square, painted backgrounds for the signal arms. A slot in the square permits the arm to be seen against the sun, while the white background removes the confusing dazzle.

## TRACTOR FOR LAWN MOWER REPLACES ONE HORSE

A tiny two-wheel tractor designed for garden work has been found particularly suitable for hauling the gang mowers used on golf courses. It takes the place of one horse, and maintains about the same speed —2½ miles an hour. It is steered from the mower with a pair of handles, like a plow, and controlled with one lever. The engine is equipped with a hit-and-miss governor, and consumes about four gallons of gasoline a day. Lugs on the traction wheels prevent damage to the turf.



This Little Tractor Runs at 2½ Miles an Hour, and Replaces a Horse for Hauling a Gang Mower on Golf Courses. It is Steered with Plow-Style Handles and Controlled with a Single Lever

## BRITISH PLAN TO TRANSFORM HISTORIC WESTMINSTER

Prominent citizens of London are planning to rebuild the district around Westminster Abbey as a memorial to those who distinguished themselves in the world war. The improvements include the construction of a great avenue, 120 ft. wide, and a new Lambeth bridge. The design for the bridge will be chosen from plans submitted by architects from all over the world. Splendid buildings are projected for the University of London, for a Shakespearean theater, and for arts and science exhibits. The new avenue will contain groups of statuary commemorating the heroic deeds of the British, Canadian, New Zealand, and Australian forces, as well as those of Britain's allies. It is intended to make this the finest and most impressive monumental avenue in the British empire.

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**Circulating Grocery Store Which Makes the Rounds of Its Customers on a Fixed Time Schedule: The Patrons Bring Baskets and Help Themselves, Sometimes Riding a Short Distance While Making Their Selection, and Paying the Driver, Who Stays at the Wheel, Just as They Leave**

## CUTTING OF BOARD WALK SAVES IT FROM DASHING WAVES

When the dashing of the breakers at Brighton Beach, N. J., had threatened to undermine the board walk and carry it away into the Atlantic, the local authorities adopted the plan of cutting open

**This Broad Board Walk on a New Jersey Beach was Cut Open in Many Places to Lessen the Force of the Breakers**

spaces in the walk at dangerous points. This allowed the waters to escape easily without doing serious damage.

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¶ Canada shares Denmark's interest in the discovery of rich coal deposits in Greenland.

## STORE CALLS ON CUSTOMERS WITH LINE OF GROCERIES

There seems to be no end to the surprising things enterprising persons put into motor-truck bodies nowadays. A man in Dallas, Tex., has a whole grocery store mounted on rubber tires, and takes a complete stock of household supplies to the very doors of his customers. The traveling emporium is of the self-help variety; the proprietor-driver remains at the wheel of his craft, his patrons making their own selections and deliveries. A fixed time schedule is observed, and the customer whose purchases are not completed when time is up, gets a short ride to the next stop. The pecuniary arrangement is "pay as you leave."

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## WARNING TO AIRMEN PROPOSED FOR TELEGRAPH POLES

Airplanes have come to grief again and again, on approaching the ground, due to the relative invisibility of telephone and telegraph wires. Even at low altitudes the wires can sometimes be seen only with the greatest difficulty, because of fog, dusk, or a confusing background. So it

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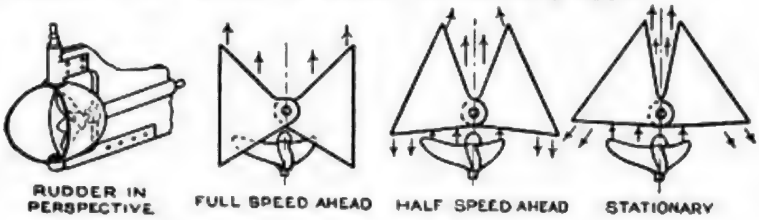
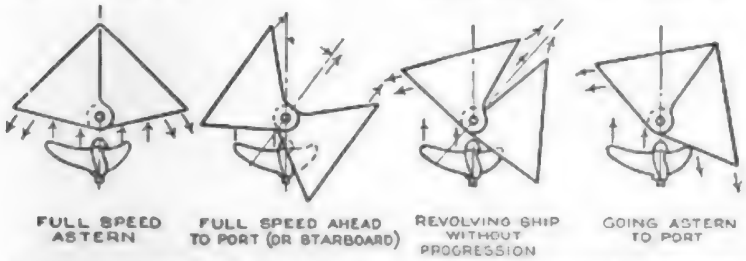
has been suggested that the top of each pole carry a large plate marked with a conspicuous warning signal, such as a combination of the Red Cross with the zigzag high-tension symbol. Such markings would make it easier for an airman to make his way across unfamliar country.

## TURNS, STOPS, REVERSES SHIP WITH PECULIAR RUDDER

While American experiments with reversing boat rudders developed the type described in Popular Mechanics last October, an English device for the same purpose successfully met the tests of the British Admiralty and is now disclosed. Its form is two triangular sections of a hollow cylinder, normally inclosing the propeller, but so attached to the tiller that they turn together or separately. Bringing the rear edges nearly together stops the boat, and wholly closing them reverses it. Either in this position, or with sides parallel for full speed ahead, it steers like an ordinary rudder. Intermediate positions give a variety of movements, closely controlled. No reversing gear is needed.




The Diagrams Illustrate the Relative Positions of the Cylindrical Blades for Executing Various Maneuvers, and the Arrows Indicate the Direction of the Water Currents in Each Position

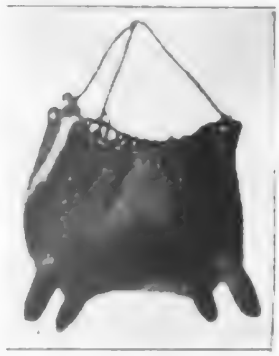
The Sensitive Rudders are Sometimes Controlled with a Tiller, as Shown Here. At the Left, the Propeller would Force the Water against the Closed Plates, Pushing the Boat Backward. With the Tiller Depressed, as at the Right, the Curved Plates are Turned Parallel to the Propeller Stream, Permitting Forward Motion

Two of the British Navy's 20-Foot Motorboats are Shown Equipped with the New Rudders, Acting as Brakes. These Rudders Quickly Rob a Ship of Its Speed and should Consequently Prove Valuable in Preventing Collisions

BY COURTESY OF THE MOTOR SHIP AND MOTOR BOAT, LONDON

## BASKET MADE OF COW'S UDDER BY INDIANS OF CHILE

The Araucanian Indians of Chile make a handy basket of the cow's udder. The flesh is first carefully removed from the skin and a hoop inserted through slits around the top. The skin is then packed full of dry peas, molded to the desired shape, and left to dry. The peas absorb the moisture and swell, stretching the skin, which is emptied when sufficiently dry to retain its form. It is next packed with wood ashes, and after a few days is dry and hard. A string for a handle completes the basket, which is useful for carrying eggs.



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# "STEVE BRODIE" AIRPLANE LANDINGS

By JOHN EDWIN HOGG

THERE is a pigeonhole in the desk of every commanding officer at all the nation's big aviation fields labeled "Steve Brodie Landings. Reports to Washington." In the air-service vernacular a Steve Brodie landing is one of the same general type as was made by that gentleman when he attained world fame by jumping off the Brooklyn Bridge and splashing into the East River. Steve Brodie not only made the spectacular jump, but he "got away with it." So that is what is meant by a Steve Brodie landing by an airplane.

There is not an aviation field in the country that has not had a certain number of Steve Brodie landings. We have all read of a good many landings in the daily press reports that were not Steve Brodies. Such landings are usually dismissed with one or two lines, stating the airman's name under a headline that tells the whole tragic story. But Steve Brodie landings are different. They are usually spectacular in the extreme, while others have been weird, or even ridiculous.

The greatest number of Steve Brodie landings occurred in this country during the feverish days after the United States had entered the war, at which time both the army and navy were bending every possible effort to produce aerial fighting men from cadets who a few weeks before did not know a joystick from an aileron. In those dark days there were numerous Steve Brodie landings resulting from cadet fliers running into each other in mid-air. One machine might lose its tail,

This Machine Fell Out of Control, from a Height of 7,000 Feet; Casualties, None

The Student Who Made This Landing Isn't Very Proud of It. He Found That He Was Afraid to Land His Machine; So He Flew Around and Around Until His Gasoline Tank Ran Dry, When He Landed as Best He Could; Casualties, None

During a Cross-Country Flight, the Cadet at the Controls of This Biplane Decided to Stop for Tea at the Little Roadside Inn. He Stopped, but on the Roof, and Not on a Near-By Field as He Intended; Casualties, None



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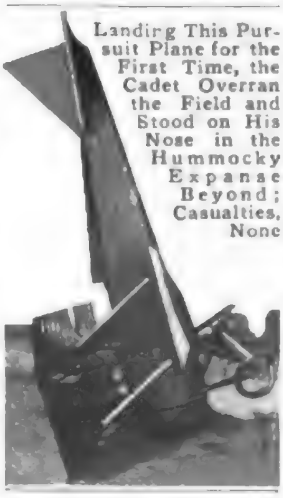
**The Unusual Landing Pictured at the Center of the Opposite Page is Here Shown from Another Viewpoint. A Timid Novice Forgot How to Make a Good Landing, but He Succeeded in Making a Remarkable One. He should Have Great Respect for the Providence Which Watches over Beginners in All Professions**

and the other a portion of one wing. Then there would likely be two Steve Brodie landings. Of course, a certain number of these accidents were traced to unavoidable causes, such as defects in the machines, motors stopping over country where safe landing was impossible, a v e r s e weather conditions, and other things. The best feature of such landings, however, was that with each one something was learned to advance man's conquest of gravity, until the number of Steve Brodie landings are far less numerous today than they



Landing This Pursuit Plane for the First Time, the Cadet Overran the Field and Stood on His Nose in the Hummocky Expanse Beyond; Casualties, None

w e r e a few months ago, in spite of the steady growth in aeronautical activities.

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¶ For the blind people of Great Britain a geographic and industrial atlas of the Isles has been prepared. More than 20 maps are included in the 222 pages of the volume, each map embossed for study with the finger tips. Every detail on the map bears an identification number the interpretation of which is given by a key on the page facing the map.

**The Engine in This Biplane Stopped at 2,000 Feet, over Wooded, Hilly Country. A Tiny Pasture Was the Only Possible Landing Field. By Squeezing the Last Bit of Glide Out of His Machine, the Cadet Reached the Pasture—to Discover a Herd of Cows There before Him. Powerless to Rise Again, He Landed on the Brush-Covered Hillside; Casualties, None**



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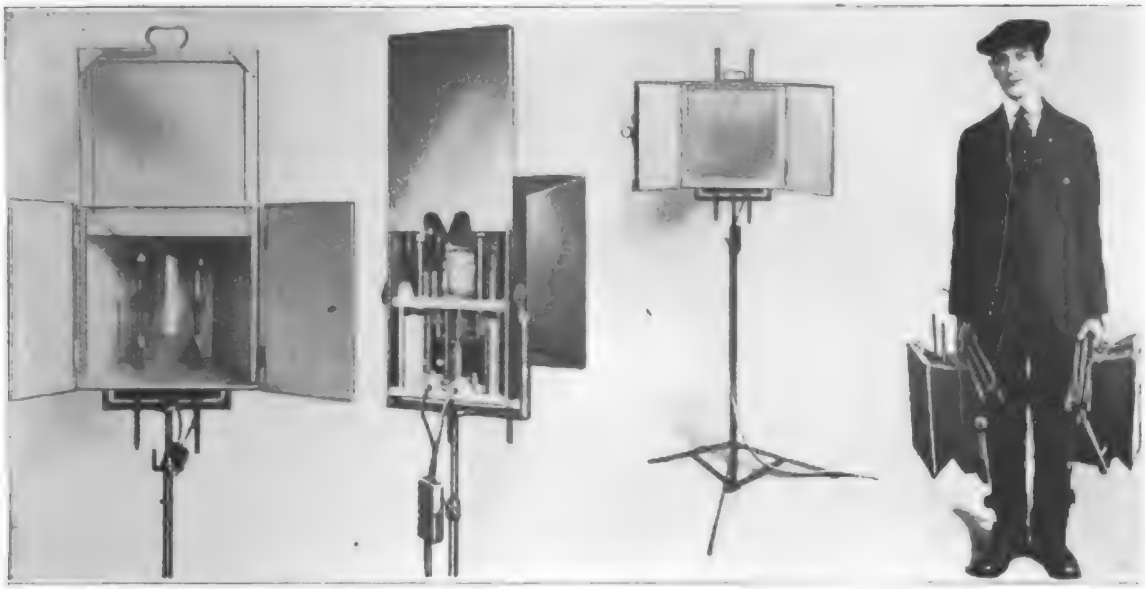

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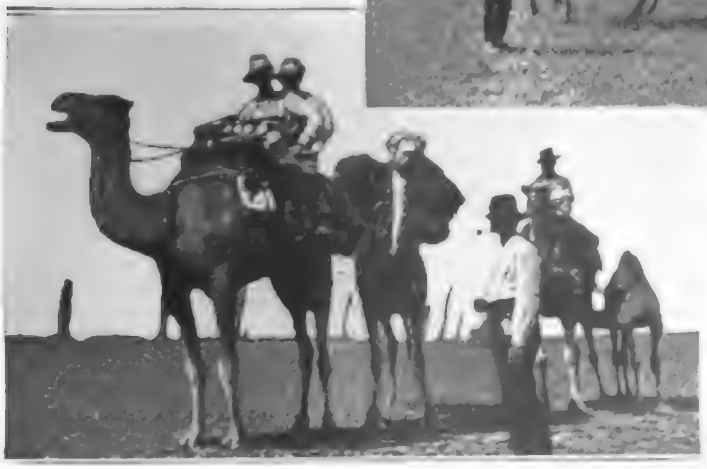
**POWERFUL PORTABLE ARC LAMP FOR MOTION-PICTURE WORK**

**THIS photographer's arc is so light and compact that the man on the right has no trouble carrying two of them. In the view at the left the spun-glass diffusing screen is raised to reveal the twin arc, of magnesia-cored carbons. In the next view the back is open, exposing the automatic-feed solenoid in the center, and the two rheostat coils at the sides. Set up on its folding tripod, it is ready for work in the third picture. Motion-picture men find it powerful enough for their work.**

## CAMELS CARRY FOOD TO MEN ON INFLUENZA PATROL

Along the westernmost section of the 750-mile boundary between Queensland and New South Wales, Australia, stretches a high wire fence. For 150 miles it runs across parched desert plains, along stony ridges, and over bleak sand hills. It was originally erected to prevent migrations of rabbits into Queensland, and was later made higher to keep wild dogs out of New South Wales. But lately the fence has done extra duty in helping the patrol police in their efforts to stop the spread of the dreaded "flu," by preventing unnecessary travel across the border. The patrol work, which consists chiefly in guarding the various gates, has been accomplished despite the sizzling heat and the almost complete absence of natural

**This Camel Train Carries Men and Supplies over the Parched Plains to the Lonely Sentry Posts along the Westernmost Section of the Boundary Line**



**Another View of the Camel Train Which Carries Rations to the Guards on the Desert Boundary Line: From Headquarters to the Farther End of the Fence Is a Little Less than 200 Miles**

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nourishment for man and beast. The police on the south side of the fence are forced to carry supplies for 40 miles, while the patrolmen on the Queensland side are separated from their base by so many miles of waterless desert that supplies have to be forwarded to them on camelback. The camel-transport service is maintained on a schedule that calls for travel of 20 to 50 miles a day. In addition to this service, camels are also used to carry the police to and from their posts.

## TWO SHIPWAYS SERVED BY ONE HAMMERHEAD CRANE

One Great Lakes shipyard has placed its 10-ton hammerhead crane so advantageously that it can assist in the construction of two ships from a single track. This economy of space and operation is secured by placing the track for the great crane midway between the two shipways. As the crane has an effective radius of 95 ft., it can thus serve practically every point in either shipway. Within a radius of 50 ft., it can lift a load of 10 tons, and at the tip, a load of five tons.

This Ten-Ton Hammerhead Crane is Centrally Placed between Two Shipways So That It can Serve Both Equally Well. Its Great Radius of Action Enables It to Reach Almost Any Part of the Two Jobs

## DANGEROUS OCEAN CURRENTS SPOTTED BY CHEMICAL TEST

The old "sea dog" will be horrified to learn that, as a result of an expedition into the tropical Pacific, the chemist's test tube may take its place with the sounding line as a navigating instrument. Traveling through the reef-strewn waters between Hawaii and Australia, the scientists made chemical tests of the dangerous easterly currents which "buck" the prevailing westerly drift, often forcing vessels off their course in the night to run the risk of destruction on some low-lying island. In every case the use of a chemical indicator showed the water in these countercurrents to be relatively acid, while ordinary tropical currents are more or less alkaline.

## AIRPLANE TO UNITE ISOLATED TOWNS OF INTERIOR PERU

The Peruvian government has decided to bind more closely together the scattered communities on the eastern slopes of the Andes by means of regular airplane service, handling mail, passengers, and freight. It is possible that the first route will extend from the city of Huanuco, high in the Andes, northward along a branch of the upper Amazon, then eastward over passes in the high mountain ranges, to Iquitos, 500 miles away. Iquitos is 2,653 miles from the mouth of the Amazon River, yet is touched by many foreign ocean-going vessels, making it the center of the Peruvian river-transportation system.

## PRIZES OFFERED FOR EMBLEM FOR AMERICAN LEGION

The American Legion wants an official emblem, suitable for wear on a coat lapel, and is offering prizes of $50, $25, $15, and $10 for the four most acceptable designs submitted before August 1. The emblem must be simple and capable of construction without the use of enamel, and the contest is open to everybody. Charles Parsons, 663 Downington Avenue, Salt Lake City, is secretary of the Emblem Committee.

¶ Iceland's traditional isolation has vanished with the erection of a wireless station which now receives daily press bulletins from Scandinavia, England, France, and Germany.

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This Dead Whale was Washed Up on a Florida Beach. It Was of an Arctic Species and had Probably Met Death in Collision with a Ship

## FORTY-SEVEN-FOOT WHALE FOUND ON PABLO BEACH

Recently a workman at Pablo Beach, Fla., found a whale measuring 47 ft. 3 in. in length. The monster had been washed ashore and was dead, wounds indicating a ship had struck it, or that it had been attacked by sharks. It is said that it was of the arctic or Greenland variety of whale, which when full-grown attains a length of 45 to 50 ft. Since these whales seldom venture beyond the southern limit of drift ice, it probably met with death in northern waters.

An Extensive Wall of Canvas was Erected to Screen the Big Carcass from the Public Eye during Preparations for Interment

## RAISE SUNKEN DREDGE BOAT WITH COMMON JACKS

A dredger grown old in its service along western waterways suddenly gave up the job one day and sank in 35 ft. of water. It was not much of a loss, as a boat, but its equipment was worth $75,000, and the hull obstructed the channel. Skillful divers managed to loosen the bolts of the engine and the 70-ton boiler, and a derrick on shore salvaged them. Raising the hull was a more difficult task. Heavy chains were worked under it and their ends brought up to two barges moored alongside. Huge beams, to which the chains were attached, were then gradually raised by means of house movers' jacks, which were readjusted after each foot or so of lift. The job was finished in 20 days.

The Method of Salvaging the Old Dredge is Shown at the Left: Heavy Chains, Passed under the Hull by Divers, were Secured to Beams on Barges at Either Side. The Beams were Then Raised with House Movers' Jacks. The Equipment at the Right was First Removed by a Derrick on the Shore

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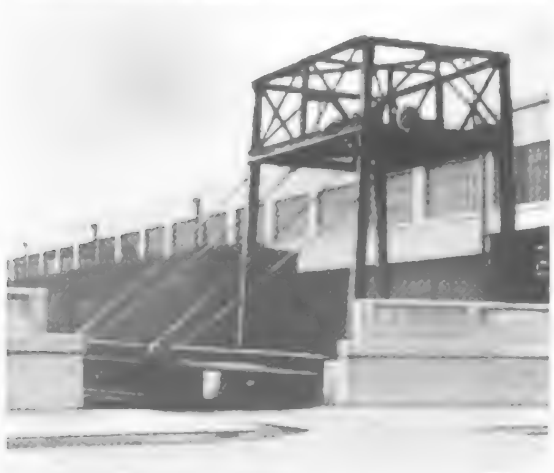
## SMALL ICE SHEDS MAKE DELIVERY ECONOMICAL

Small wooden buildings whose interiors are fitted as refrigerating rooms are stationed at intervals throughout the residence district of a western city. These are supplied from big trucks which deposit several thousand pounds at a time. The local wagons, in turn, are filled from these stations.

This Is One of a Series of Refrigerated Sheds Which are Scattered through the Heart of a Californian City and from Which Local Ice Wagons are Loaded. Each Station Has a Capacity of Several Thousand Pounds

## DRAWBRIDGE ACROSS TRACK SAVES VALUABLE TIME

A drawbridge several miles from navigable water may seem entirely uncalled for, but such a bridge is used in connection with a southern California warehouse. A spur railroad track runs down the center of the warehouse yard, and to save time in unloading, platforms level with the car floor were built on each side of the track. Whenever it was desired to get a truck from one platform to another, it was necessary for it to go down off the platform, drive round the block, and go up the incline to the other. This took 10 or 15 minutes of valuable time. The difficulty was eliminated by constructing several small drawbridges over the track. When it is desired to move the train these are simply lifted up.



The Drawbridge Connects Two Elevated Loading Platforms of a California Warehouse and is Lifted to Permit Use of the Spur Track Which It Spans

## WOODEN PAVING BLOCKS BULGE IN TORRENTIAL RAINSTORM

A rainstorm of an intensity seldom seen outside the tropics visited Pensacola, Fla., not long ago. Little or no damage was done by the accompanying wind or lightning, but the volume of water dropped upon the city was so tremendous that gardens were washed away, sand and clay-surfaced roads ruined, and railroad tracks inundated. The city engineer took most interest, however, in the misbehavior of the wooden-block pavement. Everywhere it expanded, bulged, and fell back in a hopeless jumble, menacing traffic and throwing street-car tracks out of alinement.

The Swelling and Disruption of the Wooden-Block Pavement Was the Most Curious Damage Done by the Great Rainstorm Which Recently Fell upon Pensacola, Florida

## PICKLED SEAWEED LATEST OF TABLE RELISHES

Seaweed, at least in some of its various forms, is not only edible but declared to be really delicious when properly pickled. A scientist in the government service in California has developed a process for pickling the kelp of the Pacific coast, and Los Angeles stores are already offering it, put up in bottles.

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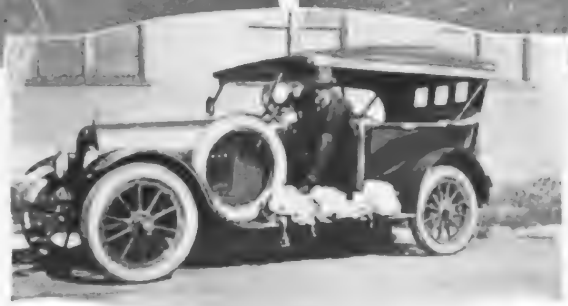
# SEVEN-ROOM TENT HOME FOR MOTORISTS

The Owner has Lifted a Corner of the Tent Home, Disclosing a Bedroom

The Garage of the Tent Home will Conveniently Shelter a Touring Car

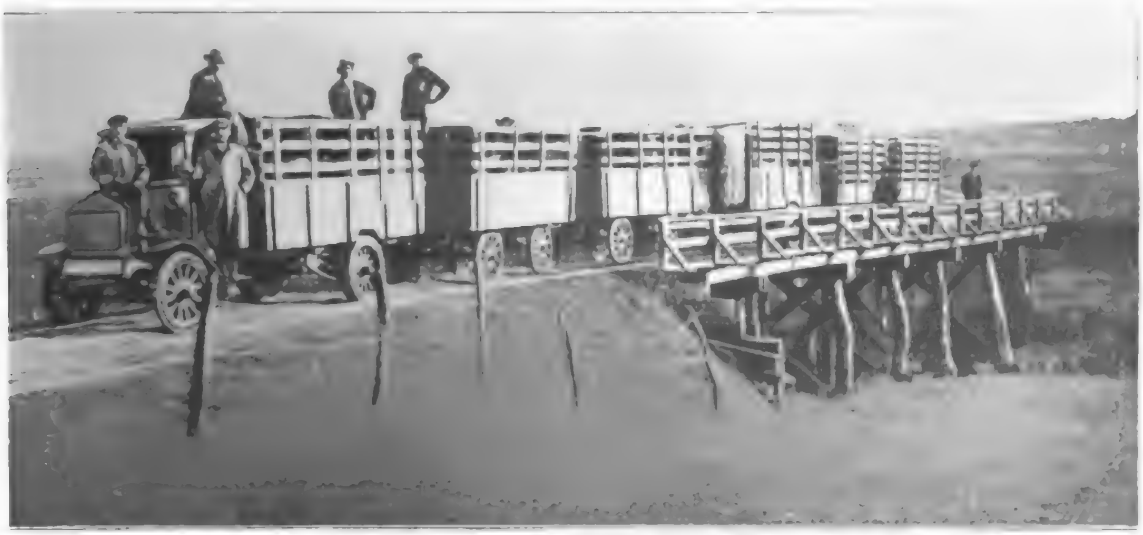


Made of the Lightest Materials, the Tent Weighs Only 124 Pounds, and may be Collapsed to Small Compass and Lashed to the Running Board

The up-to-date cross-country motorist may now equip himself with a most elaborate roadside home. Weighing complete only 124 lb., the entire equipment may be lashed to the running board; yet, when erected, it will furnish four bedrooms, a 7 by 11-foot dining room, with a similar room for general purposes, and a 20 by 6¾-foot garage. Screened windows with storm flaps keep out mosquitoes and bad weather. Another feature which recommends this new accessory is the fact that the tent is not dependent on the auto for support. Hence the family may take an evening ride to the local movies, or other trip, after the labor of pitching tent and cooking supper. The garage will shelter one large seven-passenger car.

# MOTOR-TRUCK TRAIN CARRIES FIFTEEN TONS

In Texas a cattle train consisting of a two-ton motor truck and five trailers has been used in transporting 70 head of sheep and 17 head of steers from Farmersville to Fort Worth, a distance of 90 miles. Twenty-two miles of the road was traveled through heavy mud. The net weight of the animals making up the cargo was 29,500 lb., and the motor train was about 100 feet long.



This Auto-Truck Train Made a Recent Trip over a Texas Roadway. Seventy Sheep and 17 Steers Burdened the Two-Ton Truck and the Five Trailers, but the Journey was Made with Gratifying Ease

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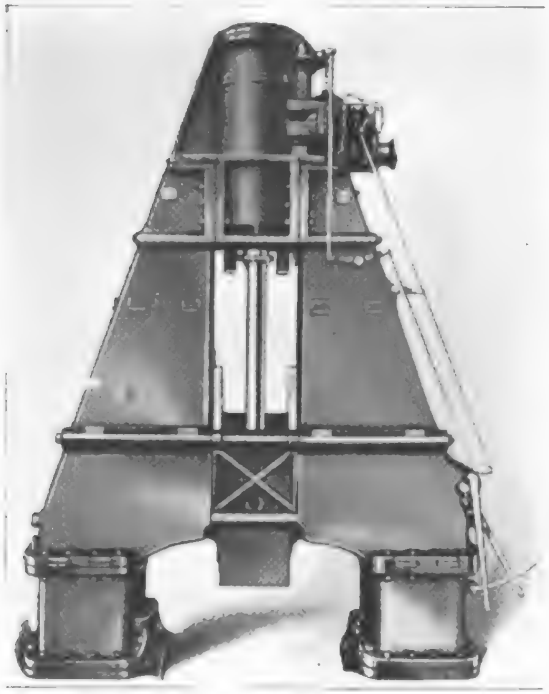
## LARGEST DOUBLE-ACTING STEAM FORGE HAMMER IN U. S.

The largest double-acting steam forge hammer ever built in the United States is a 40-ton, double-frame, having a cylinder of



**This Massive Forge Hammer Weighs 600 Tons and can Deliver a Blow of 8,000 Tons. Dismounted at the Factory, It was Shipped to the Purchaser on 14 Railroad Cars**

40-in. bore and a 96-in. stroke. The main pipe is 10 in., the exhaust 14 in., and the large piston rod 15 in. in diameter. The ram is 51 in. wide, 66 in. front to back, and 72 in. high, and is notched to handle a steel die, 72 in. long, 41 in. wide, and 28 in. high. The die weighs approximately 10 tons, and the total weight of the falling parts is 80,000 lb. The hammer was built for use with 100 to 150-lb. pressure to the square inch, and with full pressure can deliver a blow of 8,000 tons. The total weight of the hammer is 600 tons, and it required 14 railroad cars to move it in sections when shipped.

## SERBIAN CANAL TO CONNECT DANUBE WITH ÆGEAN SEA

To give the Serbian hinterland direct connection with the Ægean Sea, Greater Serbia is about to construct a 375-mile waterway from the Austrian village of Kevevara, on the Danube opposite the mouth of the Morava River, to Saloniki. Following the course of the Morava into the mountains, the route then crosses by canal to the headwaters of the Vardar River. It follows this stream to a point near the mouth, whence a short canal takes it into Saloniki. The rise from the Danube to the top of the divide is nearly 1,000 ft., and the drop from the other side to Saloniki about the same, making necessary at least 65 locks. It is estimated that 1,000-ton barges will require eight days to travel the full length. The cost of the entire undertaking is expected to exceed 80 million dollars.

## BENT STEEL FLAGPOLE CUT OFF AND SPLICED

Patriotic citizens of Battle Creek, Mich., celebrated the first Liberty loan by erecting a steel flagpole, 123 ft. high. Last Thanksgiving Day a strong windstorm bent the pole to an angle of 45°, 44 ft. from the top. The local steeple jack was employed to cut off the 44 ft., and from this piece he cut 8 ft. more to remove the bent portion, leaving 36, with which he made a 5-ft. splice onto the lower section, so that the pole now stands 110 ft. above the ground. The ball originally carried on the top of the pole was 2 ft. in diameter, but it has been replaced by one only 1 ft. in diameter. To place the new ball the steeple jack made a special trip to the top, and painted the pole as he slowly descended to the ground.

**The Steeple Jack is Shown, on the Right, at Work on the New Ball. During the Descent from His Hair-Raising Position He Painted the Long Pole, as Pictured at the Left**

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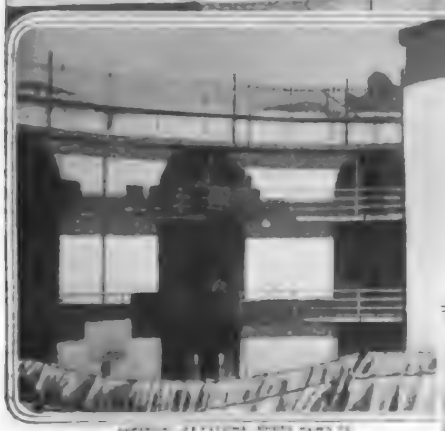
# MILITARY OFFENDERS CAGED IN ANCIENT FORTRESS

The Famous Sky Line is Seen behind the Sentry on the Wall of Old Castle William. Here, in Busy New York Harbor, the Government Confines Many of Its Military Prisoners



This Is the Circular Courtyard of Castle William, Showing How the Three Tiers of Gun Casemates have been Transformed into Cells for Offenders against the Army Law. Constant Watch is Kept from the Tower

Castle William, the Antiquated, Casemated Fortress Which has Guarded New York Harbor for More than a Hundred Years

Stormy Discussion of the Alleged Injustice of the Army Court-Martial System Lends Particular Interest to This Picture of the Noonday "Check Roll Call" at Castle William. Many of These Prisoners have Just Returned from France; Others have Offended in the United States. All of Them have been Granted a Rehearing by the Commanding Officer, Who has Often been Able to Reduce Their Sentences



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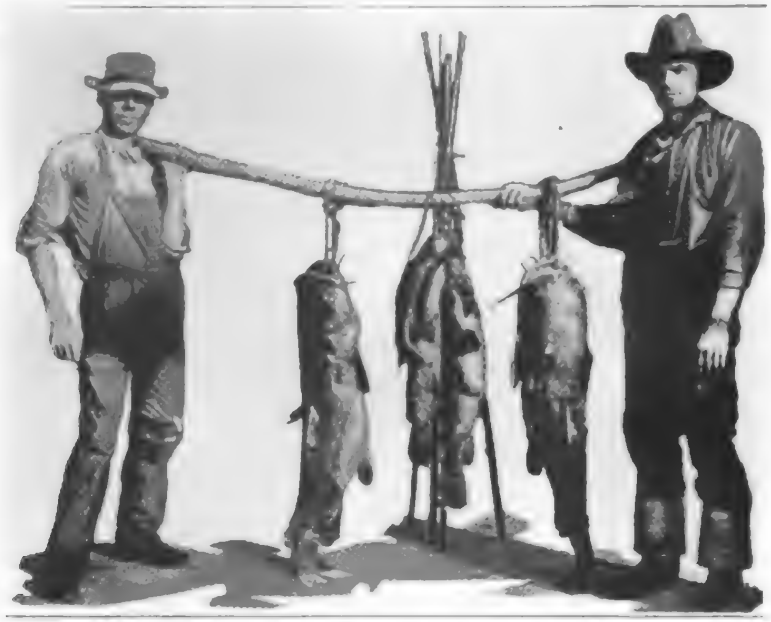
## FISHERMEN GET GIANT "CATS" BY WHALING METHODS

A couple of market fishermen of southeastern Kansas are catching big river "cats" with tackle that somewhat resembles an old whale fisher's equipment, except that enormous barbed hooks take the place of harpoons. Each hook has a socket instead of the usual eye, and is held by friction on the end of a long pole, to which it is also fastened by two feet of stout cord. Familiar with the habits of the giant catfish, the men have no difficulty in locating the holes where they lie. When a fish is "snagged," the jerk detaches the hook from the pole, and the captive is played until it gives up.

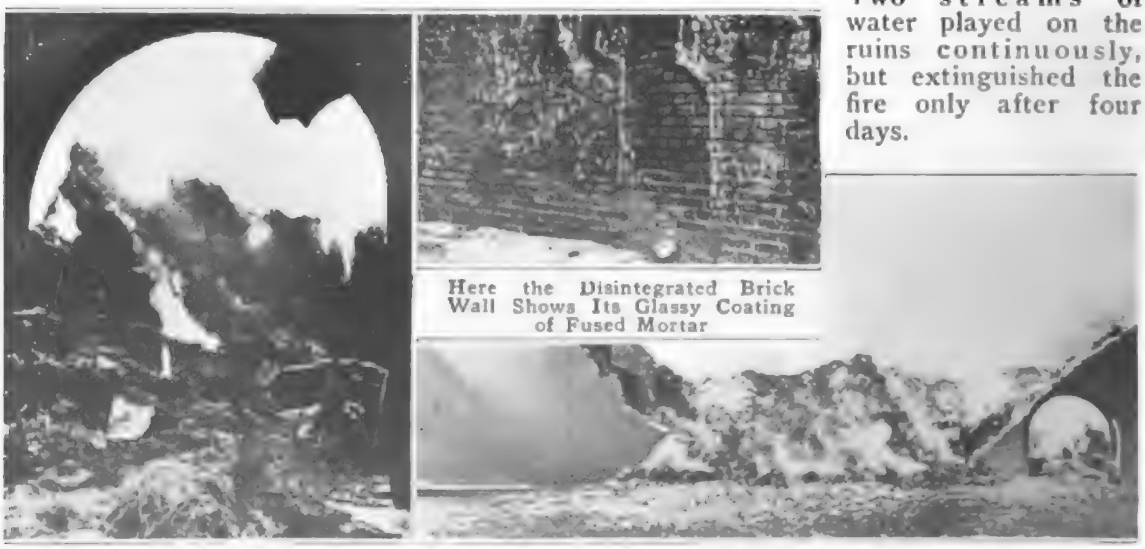


These Kansas Fishermen Capture the Big Catfish by a Method of Their Own, "Snagging" Them with Great Hooks on the Ends of Long Poles. The Catch Shown Here Weighed About 120 Pounds, and was Taken in Less than an Hour

¶ One of England's great railroads is painting the handrails on its brake freight cars in white enamel so that they may be easily seen by the trainmen at night.

## FIERCE HEAT OF BURNING HAY MELTS BRICK WALL

Because of its high proportion of contained air, stored hay burns furiously and with extreme heat. When the hay which filled a large brick warehouse at Los Angeles, Calif., caught fire recently, the wall on the street side collapsed in three hours. Examination of the brick surface after the fire revealed a glassy mass of fused mortar, while even the bricks themselves had not wholly resisted the terrific heat. Two streams of water played on the ruins continuously, but extinguished the fire only after four days.



Here the Disintegrated Brick Wall Shows Its Glassy Coating of Fused Mortar

Hay Stored in a Los Angeles Warehouse Burned at Such a High Temperature That the Brick Walls Crumbled and Collapsed in Many Places. Inspection of the Few Surviving Sections of the Walls Showed That in Many Places the Mortar had Fused, Covering the Brick with a Glassy Coating

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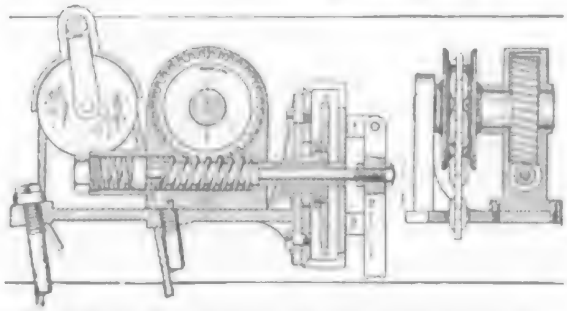
MARSHALL & FOX, ARCHITECTS
**Perspective Plan View of the Great Stadium Proposed as a Chicago Memorial to Local Men Who Lost Their Lives in the War: It is Planned to Cost $10,000,000 and will Seat 100,000 Persons**

## CHICAGO PLANS HUGE STADIUM AS SOLDIER MEMORIAL

A mammoth stadium, to seat 100,000 persons, to cost $10,000,000, and to be built wholly by returned fighting men, is the memorial Chicago proposes to erect in honor of its soldier dead. Grant Park, on the city's lake front, is the location contemplated for the great work, general plans for which already have been drawn. Arches, 90 ft. in height, giant pillars, and imposing colonnades will inclose the vast ring of terraced seats, whose central field will accommodate the most elaborate of ceremonies, conventions, or athletic events. Halls at the ends of the façade will seat additional thousands under cover. The idea of the memorial is to combine usefulness with magnificence, and to pay tribute to those gone by attracting new life to the Garden City. Popular subscription is expected to defray the cost.

## WORM DRIVE IN AUTO HOIST DOES DUTY AS BRAKE

In his patented hoist for auto-truck dump bodies, an inventor has introduced several interesting features. Among them is an unusual mechanism, placed immediately behind the driver's seat and about five feet above the chassis frame, which acts as both worm drive and brake. Thus, to tilt the body and dump the load, the worm gear in the center of the larger drawing is turned by power from the driving shaft. The worm revolves a gear, which is marked in the drawing with a small arrow. Fixed to the gear is a drum, as shown in the smaller drawing. As the gear turns, a chain is wound on the drum, thus raising the front end of the truck body. When the body has been raised to its desired inclination, motion automatically ceases. And at this point, the coil spring, seen at the left of the worm, exerts such heavy pressure against the end of the worm that the entire gear system becomes a brake, and the body is held in dumping position while the load slides off. To return the body to the horizontal, the operator pushes home the lever seen at the right of the larger drawing thus compressing the coil spring by means of a rod which extends through the hollow worm gear. Friction between the broad teeth of the two gears is thus eliminated and the body falls into place.



**The Coil Spring, Seen at the Left of the Worm Gear, Holds the Auto Dump Body in Its Inclined Position While the Load Slides Off**

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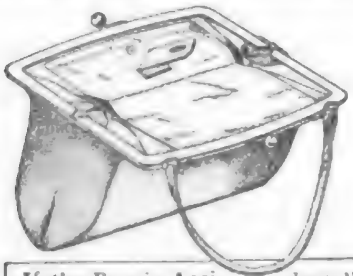
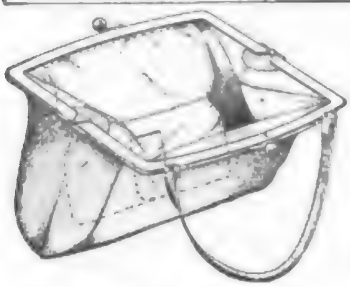
# SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

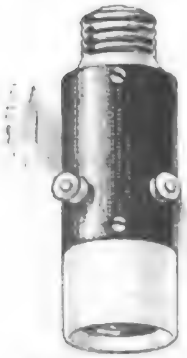


If the Bag is Acci dentally or Mischievously Opened, the Contents are Still Protected by the Flap and Its Buttonholed Tab

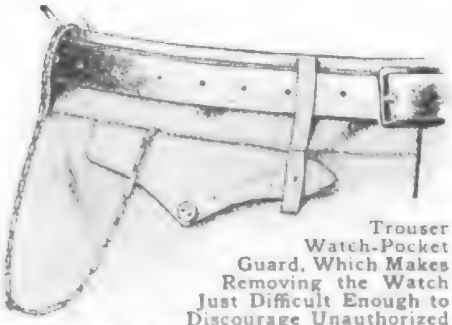


A Patented Hatpin Guide Sewed into the New Hat Assures That a New Hole will Not Appear Every Time It is Worn

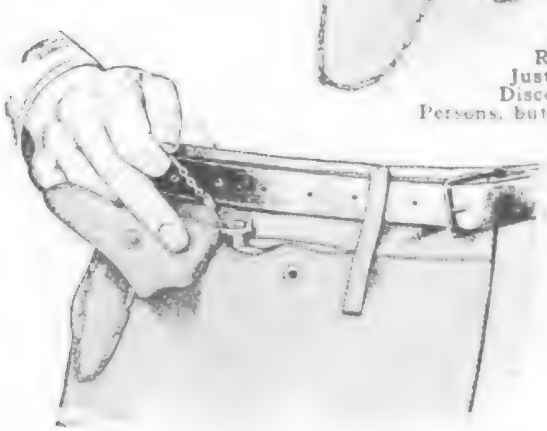
Fit Companion for the Familiar Traveler's Electric Iron Is a Three-Pound Aluminum Folding Ironing Board, Which Goes into the Suitcase

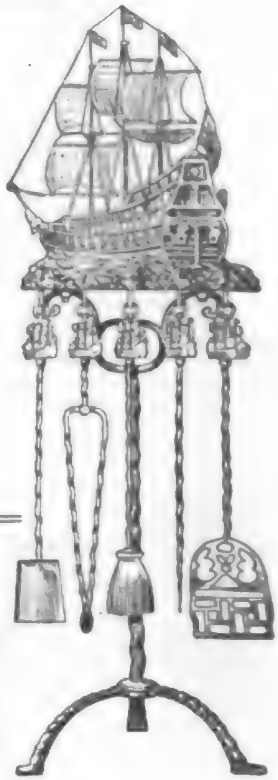


Doorbell-Ringing Transformer That Screws into Any Lamp Socket; The Lamp Then Screws into the Other End, Making It Easier to Install Than a Dry Battery



Trouser Watch-Pocket Guard, Which Makes Removing the Watch Just Difficult Enough to Discourage Unauthorized Persons, but Easy for the Owner





This Spanish Galleon Serves to Guard the Fireplace, Whose Flickering Rays, Reflected from Its Brass, Bring Dreams of Adventure, Not Dispelled by the Quaint Toaster, Tongs, Shovel, Poker, and Brush That Depend from the Base



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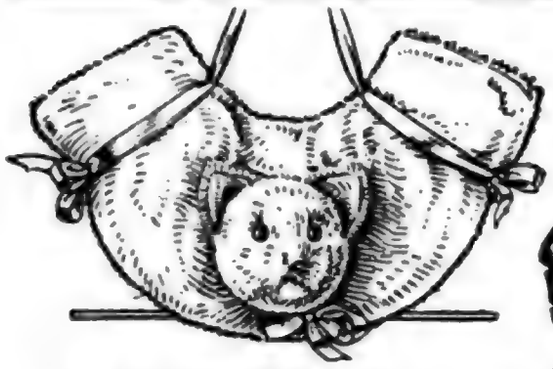
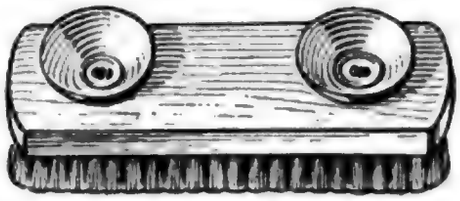


An Odd-Shaped Muff for Children That Fits Little Hands Better than a Straight Cylinder, and Has a Teddy-Bear Head for Company



Rubber Suction Cups on the Back of This Nail Brush Fasten It to Wash Bowl or Mirror, so a One-Armed Person can Use It

Mason Jars are Easily and Safely Handled in Hot Water, Even in the Dark, with a Pair of Tongs made for the Purpose

A Beautiful Table Lamp and a Well-Designed, Electrically Driven Phonograph Are One in an Ornamental Home Utility Which Combines Light and Music, or Serves Either Alone. It may be Had with Glass Shade if Preferred

Here Is a Can Opener that Cuts the Top Right Out of the Can in a Few Seconds by Simply Turning the Crank

Every Man Carries a Pocketknife, but Few a Tape Measure, though One Is Often Needed; Here Are Both in One

Little Stepladder, Just Right for Reaching Curtain Rods and Ceiling Corners—or an Equally Handy Kitchen Stool, Which Folds Compactly for Storing

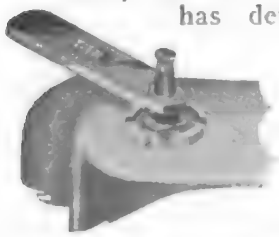
Tray for Putting Up Fruit: During Cooking It Rests on the Bottom of the Boiler, and Afterward is Lifted to the Position Shown

## STRIP OF METAL ON DRY CELL MAKES IT A FLASH LIGHT

A flash-light attachment for standard dry cells has been reduced to the simplest possible terms by a New York State inventor. It is merely a bent strip of metal, one end of which clamps to the carbon post of the cell, while the other end is bent over the zinc post and carries the lamp bulb, in either vertical or horizontal position. Thumb pressure on the end makes contact between the lamp and the zinc post. The lamp holes have upset edges in place of threads, and a slot in the metal gives them a spring grip on the lamp base.

## SIMPLE ADJUSTABLE WRENCH FOR HEXAGON NUTS

There is little affinity between an ordinary monkey wrench and a hexagon nut; so an Oklahoma inventor has devised a specialized wrench, particularly adapted to spark-plug work, and consisting of a sliding sleeve on a slotted bar. Between the end of the slot and the sleeve, four of the nut's six sides are tightly clamped by a screw centered in the handle. This simple, straight tool will fit nuts from 3/8 to 1¼ in. in size.

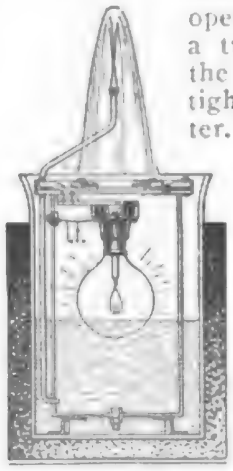


## AERIAL PHOTOGRAPHERS TO BE TRAINED IN RECRUIT SCHOOL

Experience in France has taught the chiefs of the United States Army to place such high value on aerial photography that a permanent school will be established in Virginia for instruction in this service branch. Here will eventually be sent all recruits for this branch of the service, to learn the use of this "eye of the army" which pierces the enemy's cleverest camouflage over trench or gun emplacement. As an inducement to service of this sort, recruiting authorities point out that the trained aerial photographer would be certain of employment on discharge from the army. He should be able to use his craft in making maps, in plotting surveys of inaccessible areas and of great construction projects, in studying coast lines and coastal waters, and in half a hundred other ways. Job-hunting young men are also reminded that an increase of 50 per cent in pay is allowed those on "flying status." Thus, for instance, a "flying" private draws $45 instead of $30, and a master electrician $121.50 instead of $81 a month.

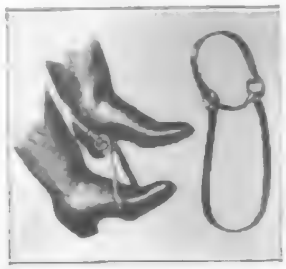
## SMALL FOUNTAIN OPERATED BY INCANDESCENT LAMP

A pump of some kind is generally considered necessary to a self-contained fountain; but an Ohio inventor operates one by the heat of a tungsten lamp placed in the upper part of an air-tight jar half filled with water. Expansion of the air when the lamp is turned on sprays the water through a nozzle at the top. Returning, it runs into an outer compartment of the jar. When the current is turned off, contraction draws the water back into the center container through a valve.



## MAKES ADJUSTABLE BOOTJACK FROM A SINGLE STRAP

Army boots restored interest in the bootjack, and one has recently been patented which is made from a single strap. Metal rings shape it into two loops, one of which is placed about the heel of the boot to be removed. When tightened, it is held by friction between two of the rings. Pushing with the other foot in the other loop pulls the boot off.



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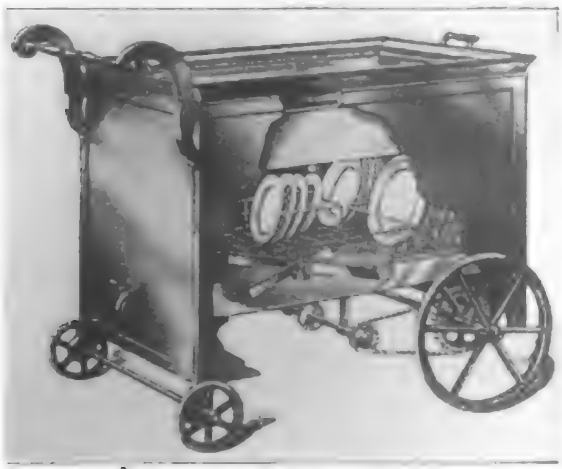
## YEAST MADE IN BREWERIES GOOD WHEAT SUBSTITUTE

That a brewer's vat may serve as an efficient substitute for a wheat field is the latest suggestion of science calculated to shine through the gloom that hangs over the brewery business. Yeast, which can readily be grown in such a vat, is declared to possess many of the food properties of wheat. It is also a nutritious substitute for meat, and not far removed in food value from cream and butter. As prepared for eating, the yeast is dried at a temperature of 221° F., and one part is used with four of wheat to make bread. It may also be mixed with other dishes, adding palatability as well as nutriment. The tiny plants which compose the yeast family are really a form of fungus, and grow with tremendous rapidity.

## TEA WAGON AND DISHWASHING MACHINE ARE COMBINED

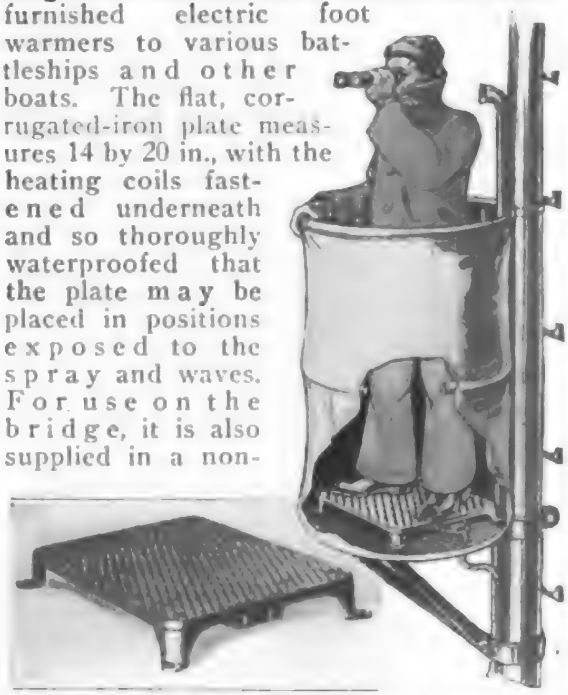
The latest application of genius to household management has resulted in a combination of tea wagon and dishwashing machine. Below the usual tray is a steel tank, with a paddle on the bottom actuated by a sprocket drive from the main axle. After the meal, the tray is lifted off, the soiled dishes are placed in a wire rack immediately above the paddle, and the wagon is pushed to the kitchen. Here the tray is replaced by a water reservoir, and enough boiling water is passed through the dishes to cover the paddle. A few trips across the kitchen floor, and the dishes are done.



The Combination Tea Wagon and Dishwashing Machine is Here Shown with the Dishes Cleaned and the Dirty Water Drawn Off through the Spigot at the Left

## ELECTRIC HOT PLATE WARMS FEET OF NAVY MEN

Many navy men find it easier to stand long, cold watches since the government furnished electric foot warmers to various battleships and other boats. The flat, corrugated-iron plate measures 14 by 20 in., with the heating coils fastened underneath and so thoroughly waterproofed that the plate may be placed in positions exposed to the spray and waves. For use on the bridge, it is also supplied in a non-magnetic material which will not affect the action of the compass needles.



This Electric Hot Plate is Designed to Warm the Feet of Navy Men on the Bridge and Even in the Crow's Nest. The Coils Are Waterproofed and Hence Not Affected by Immersion in Salt Water

## BIG FRENCH RADIO STATION HAS VARIED EQUIPMENT

The mammoth wireless station at Lyons, France, with its 1,400-kw. capacity, is now practically finished. Its engineers have taken full advantage of all recent developments, and six types of transmitting equipment are installed, each in duplicate. The receiving apparatus, housed in soundproof rooms, is equally complete. The enormous antenna stretches north and south for 2,400 ft., on eight steel towers, 650 ft. high, and consists of 20 separate strands of cable, a total of more than nine miles of phosphor-bronze wire. Each strand is connected to a switch contact in the building, enabling different combinations of wires to be used. Both French and American apparatus are installed, the latter including two 250-kw. arc-oscillation generators, a 150-kw. radio-frequency alternator, and a 150-kw. arc generator used for official communication with the American station at Arlington.

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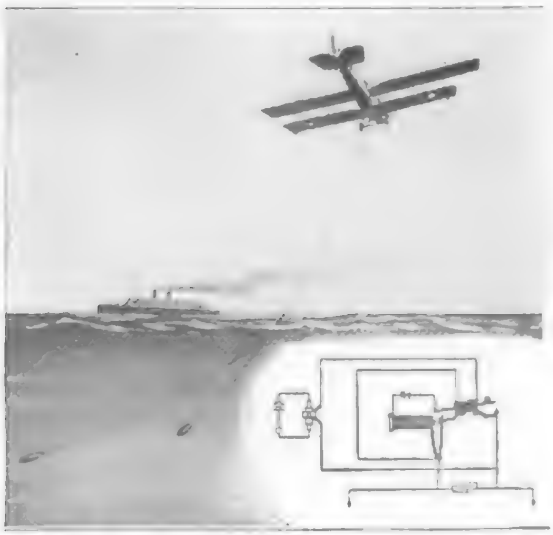
## CONCRETE POSTS MOLDED IN HOLE IN GROUND

A 5-ft. hole in the ground, or under the barn floor, makes easy the molding of concrete fence posts with a new type of hand machine. The mold, placed in a carrier, is lowered into the hole with a crank and chain, and then filled. Further turning of the crank agitates and compacts the mixture. The mold may then be lifted out and another substituted. The post is left in the mold for 24 hours and is then stored a month or two for seasoning. Standard posts have 5-in. butt, 3½-in. top, and 7-ft. length, weighing 75 lb., and two men turn out eight an hour.

## ELECTRODES IN THE SEA SEND SIGNALS BETWEEN AIR CRAFT

Seaplanes and other air craft flying over water can readily communicate with each other and with fixed stations by means of a simple British invention. A dangling cable carries two ground plates which drag in the water a sufficient distance apart to serve as terminals for an elementary form of wireless system. An interrupted current sent into the plates affects other similar plates not too distant, code messages being sent with a telegraph key.



**By Dangling a Cable with Two Terminals in the Sea, This Airplane can Send and Receive Signals, Using the Circuit as Diagrammed**

## AIR SERVICE HELPS CITIES BUILD AVIATION FIELDS

The Air Service of the United States Army is attempting to foster aerial activity, both military, postal, and commercial, by coöperation with cities throughout the nation in laying out municipal aviation fields. Because of their location on important air lanes 32 cities and towns have already been selected for the establishment of these aerodromes. Each has been supplied with detailed instructions and with blueprints explaining the official layouts. The prescribed fields average about 60 acres in area, and are either square, rectangular, or L-shaped. Great white letters and numerals, 15 ft. high, will be placed in the northwest corner of each as a means of identification. One of the strictest requirements imposed by the air service is that the fields be so located as to be capable of expansion and development in the future. This regulation seems to indicate an official belief in the growing use of the huge, multimotored planes which are constantly being made larger and larger.

## RAISE SUNKEN LOGS IN CANADA BY NEW METHODS

To recover from the bottom of Canadian streams the sunken logs that are lost while on the way from the logging camps to the mills, a newly organized corporation will employ machinery specially adapted to the purpose, instead of the ordinary devices used for moving timber. Compressed air and high-pressure water streams will be used to loosen the logs. As 10 per cent of the logs cut sink and remain imbedded for various periods without losing their value by deterioration, the business of raising them should prove to be one of great commercial importance to lumbermen.

¶About 5,000 tons of margarine, made according to government formula and sold at less than one-third the price of butter, are manufactured by British factories every week.

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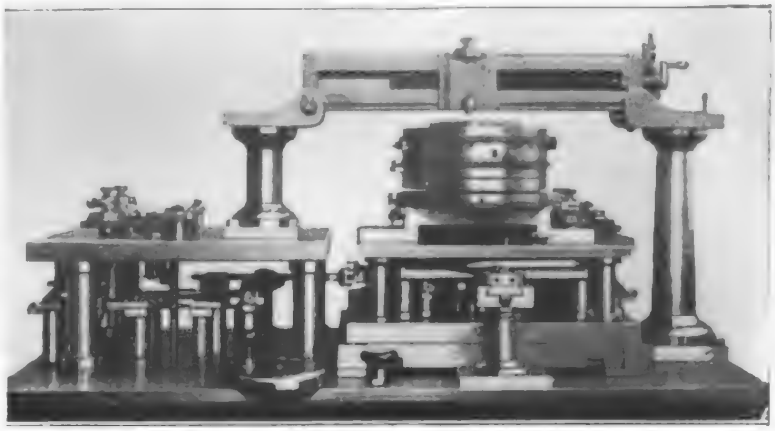
## GEOMETRIC LATHE WILL MAKE PLATES FOR MEXICAN MONEY

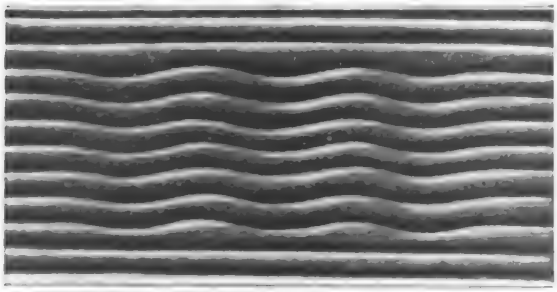
It took two years to make a geometric lathe just completed by a New Jersey firm for the Mexican government's bureau of engraving. The machine is used to turn, on steel dies, the inimitable cycloidal and interwoven patterns that decorate and protect paper money, bonds, etc., but the production of any particular pattern means extensive calculations by mathematics, and one to three days' preparation. Four feet long and weighing 1,500 lb., the lathe is so sensitive to vibration that a special concrete foundation has been prepared for it. All shafts run in ball-bearings, of which there are about 130; and the various movements of the work chuck are timed by 185 bronze change gears of 40 teeth to the inch. A ⅛-hp. electric motor drives two easily running main vertical shafts through steel spiral gears. The cutting tool is fixed, producing, as the chuck plate oscillates beneath it, exceedingly fine scrolls, squares, or ovals, accurate to the fraction of a thousandth of an inch, and which cannot be duplicated. The machine is valued at $15,000.



This Is a Geometric Lathe Just Completed for the Mexican Government, and Used for Making the Intricate Scroll Figures on the Plates Designed for Printing Paper Money and Bonds. It Makes Square, Oval, or Circular Patterns Which cannot be Imitated

## CURVING ROOF CORRUGATIONS KEEP SNOW FROM SLIDING

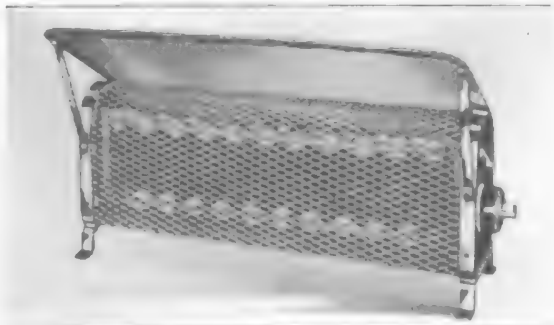
With a heavy snowfall on a metal roof there is always danger of a sudden slide breaking the snow guard and causing trouble. A Pennsylvania sheet-metal dealer has improved the situation by inventing a roof sheet with its corrugations serpentine in contour. The packed snow, unable to follow the curves or to lift itself over the ½-in. ridges, remains where it is, a uniformly distributed load, and slowly melts. The waterflow from it, retarded by the curves, does not overleap the eaves trough. Straight portions formed on the edges of each sheet facilitate making good joints.



Sheet-Metal Roof Plate with Curved Corrugations, Which Prevent Snow Slides and Retard the Rush of Water

## COMPACT ELECTRIC RADIATORS HEAT SHIPS OF U. S. NAVY

Among other conveniences provided for the sailors of the U. S. Navy is a compact electric radiator now in use on several battleships. As with everything else on shipboard all frills have been removed, and dimensions cut to three feet in length by one and a half feet in height. The addition of a deflecting shield at the back has been found to increase heating capacity by preventing heat absorption by the steel partitions of the ship. The coils may be adjusted to consume a variable amount of current.



This Electric Radiator Is of Simple, Sturdy Construction for Use on Ships of the U. S. Navy. It Is Three Feet Long by One and a Half Feet High

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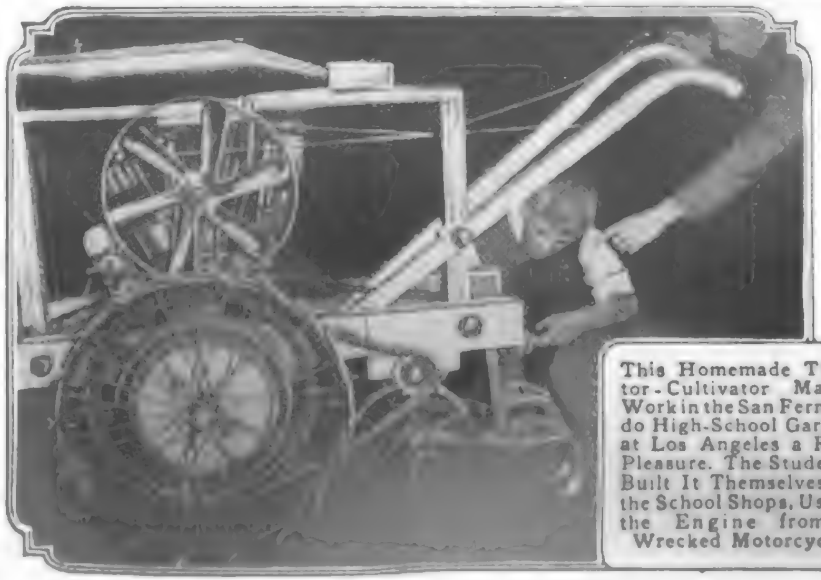
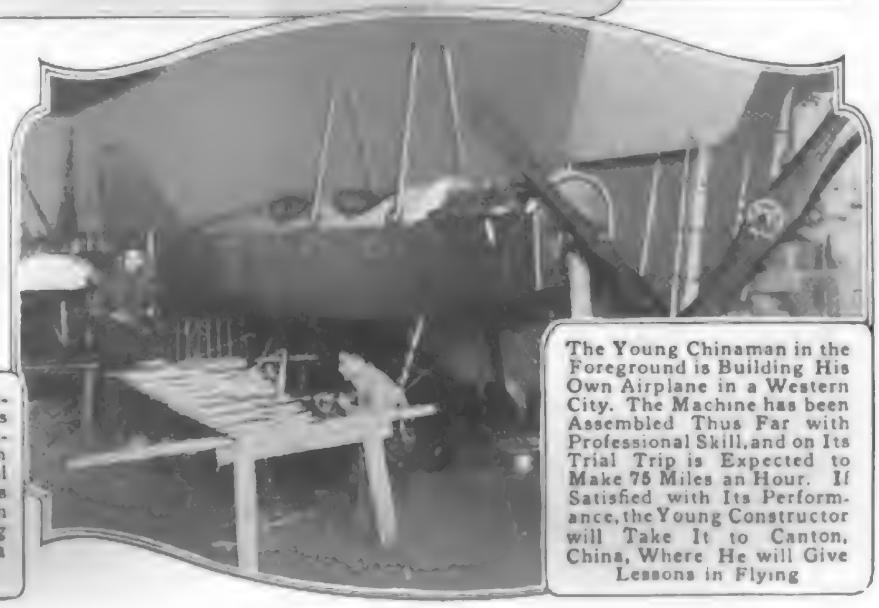
Under the Guidance of Their Manual-Training Instructor, at St. Petersburg, Fla., These Nine Lads have Constructed a "Squadron" of Miniature Airplanes. Each is Drawn through the Air by a Propeller Which Runs on Ball Bearings and is Turned by Twisted Rubber Bands. In a Recent Contest Every One of the Little Planes Performed Remarkably Well. The Second Plane from the Left Won First Place in the Distance Trials with a Record of 108 Feet; Fifth from the Left Is the Ship Which Made the Best Landing; and Seventh, the Most Carefully Built Model



This Homemade Tractor-Cultivator Makes Work in the San Fernando High-School Garden at Los Angeles a Real Pleasure. The Students Built It Themselves, in the School Shops, Using the Engine from a Wrecked Motorcycle



The Young Chinaman in the Foreground is Building His Own Airplane in a Western City. The Machine has been Assembled Thus Far with Professional Skill, and on Its Trial Trip is Expected to Make 75 Miles an Hour. If Satisfied with Its Performance, the Young Constructor will Take It to Canton, China, Where He will Give Lessons in Flying

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This House Cat Returned from a Ramble with the Little Cottontail between Her Jaws. The Youngster's Legs Are So Long That the Cat Finds It Hard to Foil His Frequent Dashes for Liberty

Thirty Children Recently Helped This Woman Celebrate the Birthday of Her Pet Lion. While the Guests Ate Ice Cream and Cake, "Pershing" Munched a Juicy Steak

Zoologists are Trying to Learn What Brought This Little Seal into Delaware Bay, Where He was Found by a Boy. This is Believed to Be the Only Specimen Ever Discovered So Far from Its Northern Home

Although This Patient Dog Had a Large Family of Her Own to Support, She Agreed, after a Little Coaxing, to Accept Another Member Who was Suffering for Want of a Mother's Care. This Was the Baby Seal Who is Seen in the Photograph being Treated on a Basis of Perfect Equality

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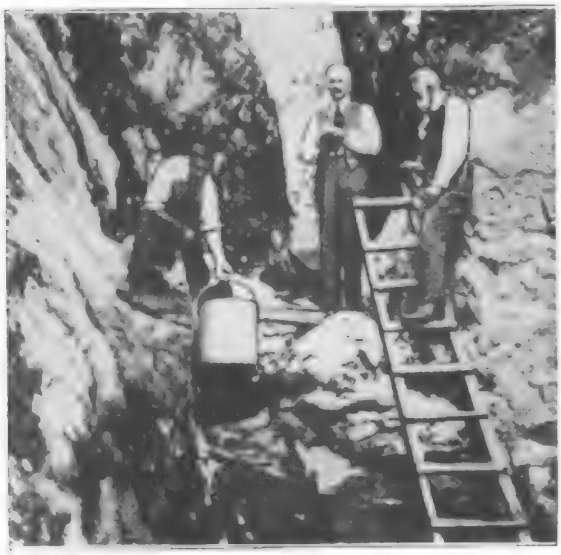
## MEASURING FLOW OF SMALL MOUNTAIN STREAM

In localities where water is scarce, legal contests are sometimes fought over the smallest streams. An affair of this sort recently made it necessary to measure the flow of a mountain brook. A miniature waterfall in the course of the stream was recognized as the most convenient place for the measurement. The brooklet was made to fill a 10-gal. bucket while a disinterested observer caught the time with a stop watch, making it easy to determine the rate of flow.



**A 10-Gallon Bucket and Stop Watch Soon Measured the Flow of This Disputed Mountain Stream**

## TREES GROW IN SOIL BROKEN BY FERTILIZING CARTRIDGE

Wild flowers and other vegetation seem to grow with exceptional rapidity in the shell-torn soil of No Man's Land. Believing this to be the result of the division of the soil into fine particles, and its impregnation with nitrates from the explosive, two experimenters have designed a fertilizing cartridge which blasts a cavity about a yard deep. After the soil has absorbed the gases produced by the explosion, a tree is planted in the hole. Working with cherry trees, the experimenters have recorded a gain of 100 per cent in rate of growth in this broken soil. Their cartridge is made of cardboard rolled in conical form. At the point is the detonator, and down the axis runs the core of explosive. Surrounding the core is the fertilizer considered most beneficial for the soil in question.

## STEEL

By LYDIA M. D. O'NEIL

I am the plow that turns the sod or ever the wheat may grow;
I am the harrow that breaks the clod, and the strength of the blades that mow.
I am the ax that fells the tree, and I am the saw that sings;
I am the hammer that drives the nail, and I am the nail that clings.

Yea, though ye dreamed a thousand dreams, I were part of all of these;
For I am the bridge that spans your streams, and the ship that rides your seas.
I am the heart of your mighty mills, and the rail that your hands have laid,
Where the pulse of the drills has pierced the hills, to follow the path I made.

I am the spike that holds the rail, and I am the engine it bears,
And I am the coach that carries the mail; my sinew and strength are theirs.
I bear the fruits of your handiwork to lands you shall never know,
And I am the motor that cleaves its way where never a rail may go.

I am the clipper that shears the sheep, and the shoe on the horse's hoof;
I am the hinge, and I am the hasp, and the rivet upon the roof.
I am the loom that weaves the wool, and the needle that fashions it then;
I am the mill that grinds the grain for the mouths of the nations' men.

I am the compass that points your path when the night is black with storm;
I am the trap that snared the wolf whose fur shall keep you warm.
I am the pick that mines your coal, and I am the crane that lifts;
I am the rotary plow that drives a road through the wintry drifts.

I am the bullet that bores your flesh, and the probe that the surgeons wield;
I am the helmet, and I am the shell that shrieks o'er the battle field.
For whether in peace or whether in war, I serve who slays or saves;
I am the sword that spills your gore, and the spade that digs your graves.

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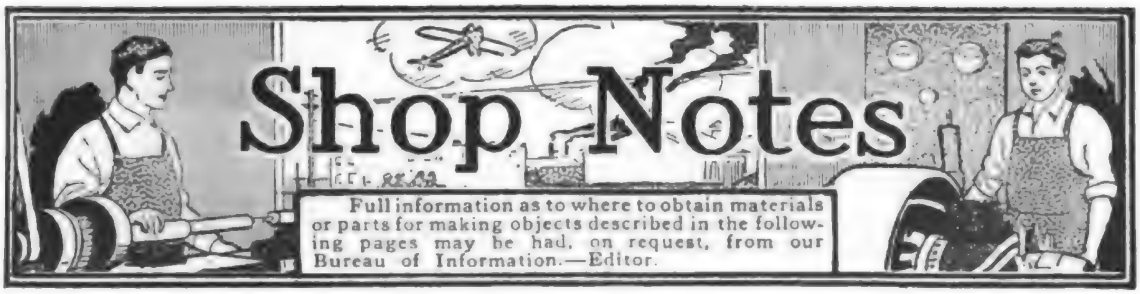


# The Care of Bark Wounds in Trees

By C. L. MELLER

BARK wounds endanger the life of a tree more than most persons realize. This is due to the fact that all the nourishment the tree receives is carried in the thin green layer just under the bark. When the bark is injured, the flow of the sap in the green, or cambium, layer is stopped, and the tree fails to receive the proper nourishment. Bark wounds may be of many kinds, but among the most serious are those caused by cutting off limbs improperly.

In removing a limb, the cut must be made as close to the trunk or branch from which the limb grows as is possible. If the work is done so that a stub remains, it is impossible for the bark to grow over the cut end. The stub then dies and the decay is carried into the trunk or branch itself. By cutting the limb off close to the trunk, the new bark, with the cambium layer underneath, gradually grows inward over the cut part, in a narrowing circle, until the wound is completely covered with bark, and thus protected. For added protection, while the healing process is going on, the exposed wood should be given a heavy coat of good paint. This should be repeated as often as necessary, until the wood has entirely healed. When this is properly done, healed wounds are difficult to detect.

Many wounds are caused by horses rubbing against trees used as hitching posts. Others are caused by sharp objects tearing off pieces of the bark. When neglected, these wounds permit decay as readily as do those caused by cutting off limbs in the wrong way. All loose or torn bark should be removed from such wounds, and the exposed wood given as smooth a surface as possible; also, the sound bark surrounding the exposed wood should be cut so that it has a continuous smooth edge. The outline of the area cut away should never be square, but should come gradually to a point at the top and bottom of the wound. Cutting the bark in this way allows the sap to flow freely around the wound and thus

**Stubs, Like Those in the Photograph at the Left, Prevent the Bark from Growing over the Wound and Healing It, As It is Doing in the Center Picture. The Bark Wound at the Right is Healing Properly, and in a Few Years will Be Hardly Noticeable**



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easily nourish the new bark that is forming.

Water must not be permitted to gather in the wound, under any circumstances, as it always hastens the decay of the remaining wood. A small groove cut into the lower end of the wound will allow the water to trickle away as rapidly as it collects. To protect the exposed surface better, it should be given a good coat of white lead or other available paint. One coat will not last all the years it takes for such a wound to heal; the wound should be given a new coat of paint whenever the previous one is worn out.

Properly treated, bark wounds will not seriously endanger the life of a tree. Repairing damages after the wood has had a chance to decay deeply is a very different matter. The same principle of removing all injured or decayed wood and bark, and preparing the surface to exclude water and to permit rapid growth of new bark, applies to the advanced condition. The photographs show bark wounds in various stages of healing, also stubs of limbs which were not cut off properly.

### Preventing Loss of Tailstock Wrenches

In a shop where several lathes were used, considerable trouble was caused by loss of tailstock wrenches, and to prevent them from being mislaid a method was found for attaching them permanently to the clamp bolts. A ¼-in. hole

A Light Rod, Screwed into a Bolt, Acts as a Lock to Prevent a Wrench from being Mislaid

was tapped in the upper end of the bolt, and a threaded piece of rod was screwed into the hole, the rod being cut to such a length that it cleared the surface of the tailstock barrel at the top when the bolt was tightened, but did not leave sufficient space for withdrawing the wrench. The bolt could, of course, be removed as usual whenever it was necessary to detach the tailstock or the wrench.—Fred D. Hood, Los Angeles, Calif.

¶A discarded piece of cotton-covered fire hose, collapsed, makes a good machine belt. It stretches a little at first, but runs very smoothly.

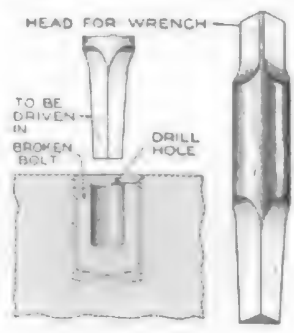
### Dry Cells Work Better When Warm

It is a fact, not generally appreciated, that dry cells give more current when warm than when they are cold. For this reason, it is not wise, nor fair to the manufacturer, to test at once a dry cell from a lot shipped in a barrel, and just received from transit in a cold freight car. Before such cells are tested, they should be allowed to remain in a moderately warm room for from 24 to 48 hours, so that their temperature may become approximately 70° F. It requires a considerable time for the cells at the center of the barrel to reach the temperature of the surrounding air.

A cell which will, on short circuit, at a temperature of 80° F., produce a current of 30 amperes, will produce approximately the following currents at other temperatures: zero, 10 amperes; 40°, 20 amperes; 60°, 25 amperes; 100°, 35 amperes. The decrease in current output at lower temperatures does not permanently injure the cell, because such a cell, when raised to normal temperature, will deliver its normal current output. On the other hand, dry cells should not be stored in hot places, because the heat dries them out, and hence decreases their output prematurely. It is, therefore, the better practice to store the cells in cold rooms, but to permit them to remain in a reasonably warm room for a number of hours before they are tested for current output.—George W. Wesley, St. Louis, Missouri.

### Tool Removes Broken-Off Bolts

A machinist in a garage has a simple tool which he made especially for the removal of broken-off bolt ends from cylinder castings, and other parts of cars.




With this tool, the work is accomplished more effectively and rapidly than by the common method of using a punch and hammer, or the tang of a file.

The tool is made from a tap, the threaded end of which has been broken off. The square head for the wrench is left on, but the opposite end is ground on the emery wheel to a triangular section, with

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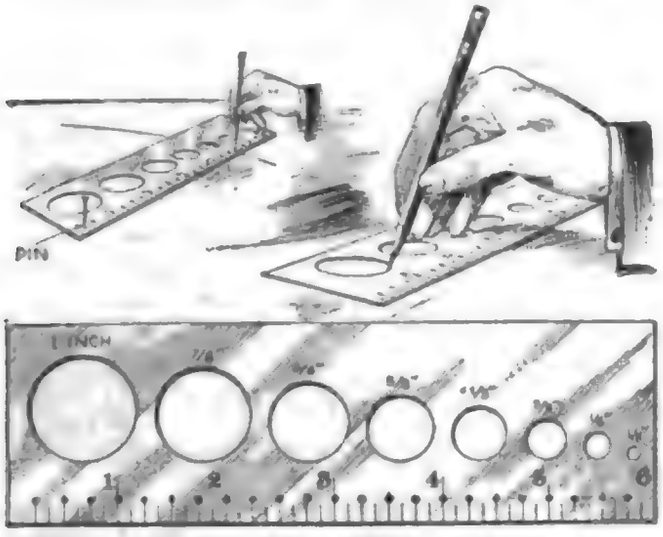
sharp edges. This end is given a slight taper, and is made of such size that when it is driven into a 3/16-in. hole it takes a firm grip. Any broken-off bolt, from 5/16 in. up to, say, 5/8 in., can be removed by drilling a 3/16-in. hole in the center, driving in this tool, and screwing the bolt out with a taper wrench. It is not difficult to make the tool in several sizes, which will have the necessary strength to handle all screws and bolts ordinarily used.—G. A. Luers, Washington, D. C.

### Padded Tray for Collecting Eggs

Collecting eggs with an ordinary pail is expensive, as several are likely to be broken on each trip; and where a large number of hens are kept, it is good policy to make a special carrier, furnished with one of the rectangular spacers that are used on egg crates. A padded bed for each egg is made out of sacking, and, if desired, the carrier can be equipped with special trays, one above the other. The eggs can all be collected on one trip, and there is little danger of breakage.

### Rule for Drawing Circles

A rule, such as illustrated, has been found very convenient by one draftsman who has a great many circles to draw. It is a fact that the circles required in ordinary machine drafting are for the most part of certain sizes varying by intervals of 1/8 in. or 1/4 in. Circles from 1/8 in. to 1 in. in diameter are drawn by running the pencil around the inside of one of the circular holes in the rule. Circles

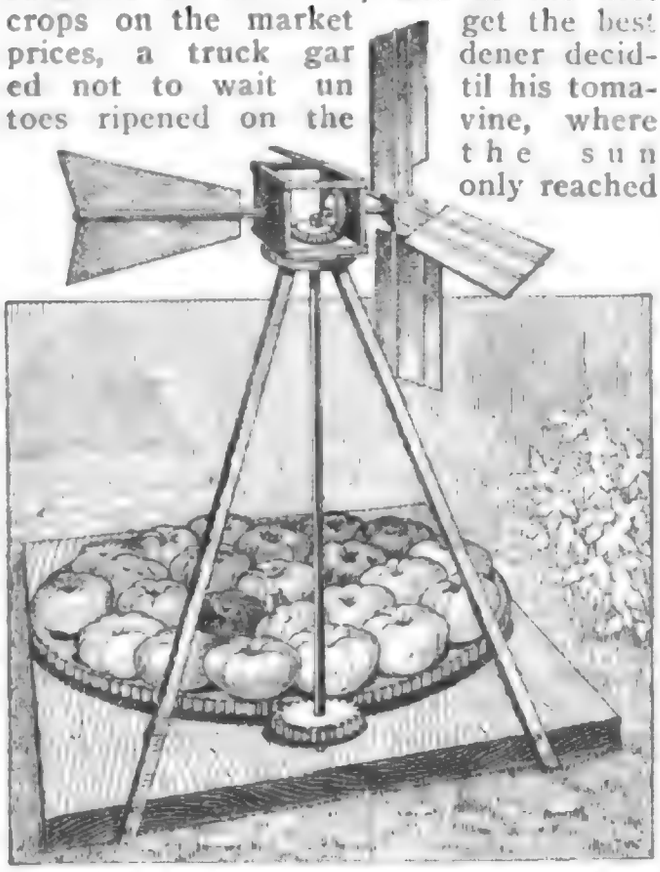



A Very Large Majority of Circles and Circular Arcs in Ordinary Drafting can be Drawn by Means of This Instrument

above 1 in. in diameter are made by the use of holes in the scale, as shown at the left.—Geo. W. Kinzie, Orting, Wash.

### Ripen Tomatoes Early by Placing Them on Revolving Table

Tomatoes ripen slowly, unless they get sunshine on all sides; and as the first crops on the market get the best prices, a truck gardener decided not to wait until his tomatoes ripened on the vine, where the sun only reached



A Small Windmill Transmits Power through a Set of Gears to a Turntable Loaded with Tomatoes, Exposing Them to Sunshine on All Sides

them on one side. Accordingly he gathered half-ripened fruit and laid it, one layer at a time, on a turntable, which exposed all sides to the sun as it revolved. He mounted a light windmill on a plank base, fixed a small bevel gear on the horizontal shaft, and set it in mesh with a bevel gear of the same diameter which turned on a vertical shaft running down to the wooden base, a small spur gear being fastened to the lower end. He then made a turntable by cutting a disk, 2 ft. in diameter, of hard wood, with a compass saw, after which he cut notches in the edge so as to make teeth which would mesh with the spur gear on the vertical shaft. As the spur gear was very small, the gear ratio caused the turntable to revolve very slowly, thus providing the best condition for ripening the tomatoes without unduly taxing the power of the mill.

A table of this kind works excellently with water power, and water-wheel connections are easy to install if a stream runs near the garden; but whatever motive power is used it is necessary to load the table evenly, so that it will balance

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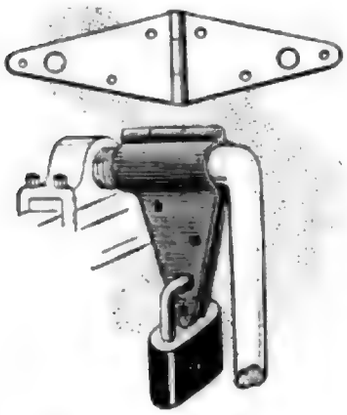
well and allow the motor to run without unnecessary handicap.—F. E. Brimmer, Dalton, N. Y.

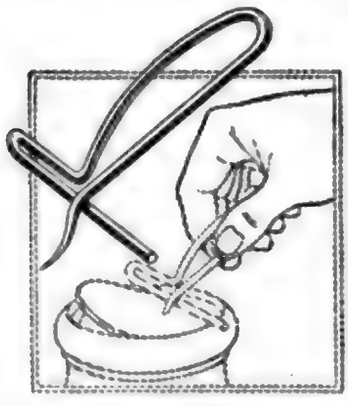
### A Lock for Light Autos

A quickly made lock, applicable to certain makes of automobiles, can be constructed from a strap hinge and a good padlock. Holes are drilled in the ends of the hinge straps, large enough to take the staple of the padlock. The straps are then bent near the joint, so that when the hinge is placed around the starting crank, the straps will come together below. The padlock is slipped through the holes and locked. When in place, it is impossible to push the starting crank in far enough to engage with the end of the crankshaft, thus making it impossible to crank the car until the hinge has been removed.—Wm. J. Neiler, Chicago, Ill.



### A Milk-Bottle Opener

A handy milk-bottle opener is made from a single piece of stiff wire by bending it as shown in the illustration. One end of the wire forms a fulcrum, on which the handle acts as a lever, forcing the milk-bottle cover up, after it has been pierced by the point at the other end. The pointed end can be twisted around the fulcrum, if the wire is not too stiff, thus making a more rigid tool.—E. K. Wehry, Cedar Rapids, Iowa.

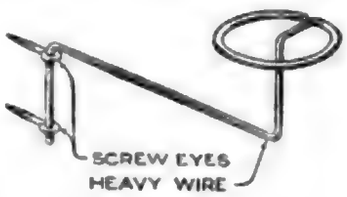


### Reversing a Large Flywheel

An engineer, who had been placed in charge of a partly assembled steam plant, found that the flywheel had faced the wrong way when it was bolted in position. The key had not been placed in the keyway, and this could only be accomplished from one side of the wheel. In its present position, however, there was no access to that side of the wheel, and it was therefore necessary to reverse it on the shaft. The wheel was 16 ft. in diameter, cast in two halves, and the lower part was sunk in a narrow pit. Lifting the lower half out of the pit would have entailed so much labor that the engineer used another method. He turned the wheel till the joint between the halves was horizontal, reversed the top half, and bolted it again to the lower half with the wrong ends in contact. He then turned the wheel through a half revolution and repeated the process with the other half.—Jack Solon, Vicksburg, Miss.

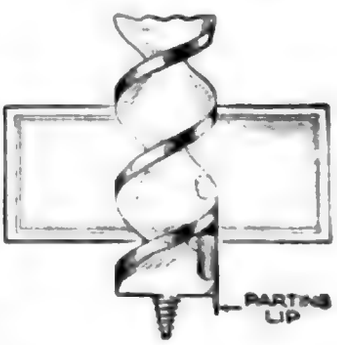
### Hook for Ladies' Hats

The size and shape of a lady's hat generally prevent it from being hung securely on an ordinary hat peg, or coat hook, and even if it does not fall off, its delicate fabric is in danger of injury from the sharp metal. The style of hook shown in the sketch meets these objections, and is made by bending a single piece of wire into the desired shape and fastening it to woodwork with two screw eyes. Be careful to make the horizontal part long enough to prevent any part of a large hat from being crushed against the wall.—A. B. Nutting, Boston, Mass.




### Removable Parting Lip for Auger Bits

When boring holes in wood with an auger bit, the parting lip of the bit may easily come in contact with a nail in such a way that its shape is ruined. When this happens the bit should not be thrown away as useless, since the lack of one may occasion great inconvenience to a millwright or carpenter who is working on a job located some distance from a supply store.




A bit which has suffered in this way may be made to give service indefinitely by the method illustrated. File away both parting lips, and make a hole in one side

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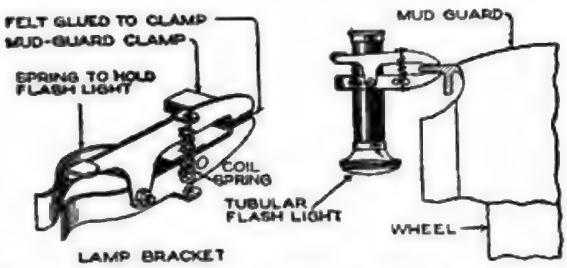
of the bit, to take a round pin, in such a way that about four-fifths of the pin's diameter will lie within the bit circle, the remaining portion being filed off after the pin is driven in. The hole for this pin is worked in with a rat-tail file. Suitable taper pins are kept in stock in machinists' supply stores.

When the pin is tightly fitted, it is filed off to the proper shape for a parting lip. Only one lip is necessary, and a bit repaired in this way will give good service. If the new parting lip is damaged, it takes only a few minutes to insert another pin, and file it to shape.—M. E. Duggan, Kenosha, Wis.

## Searchlight Clamped for Tire Repairs

For those who prefer the tubular flash light to the trouble light connected to the storage battery, for tire-repair work, a handy device is a sheet-metal clamp which holds the flash light in such a position as to throw the light where it is needed. The idea would be of little use to the driver who always has a companion to hold the light for him in case of trouble, but for those who often drive alone,

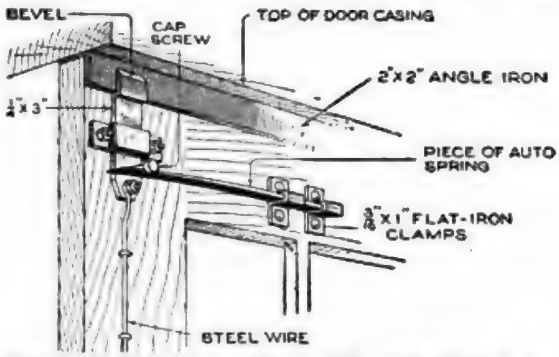



A Flash-Light Clamp Is a Great Comfort to the Lone Night Driver, in Case of Tire Trouble

there is a decided advantage. The metal used should be stiff brass or steel, but the spring which holds the flash light must of course have sufficient springiness for this purpose. The light will be found convenient for tire changing in the position shown, but if some other angle is preferred, the clamp can readily be made to give it.—P. P. Avery, Garfield, N. J.

## A Substantial Garage-Door Latch

It is a good idea to provide a large garage door with a good, heavy latch, put on in such a way that it will last for many years and will resist the efforts of thieves. The latch illustrated has been used with satisfaction, and requires no materials for its construction except some scraps of bar iron, a few bolts or cap screws, some steel wire, and a leaf from an old automobile spring. It is, however, well to get a piece of 2-in. angle iron, to

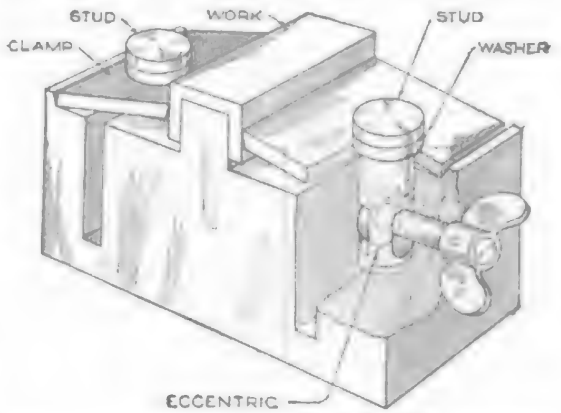



Scraps of Bar Iron and an Old Auto Spring are Made into an Unusually Durable Garage-Door Latch

use as illustrated, as this adds much to the security against theft. A coat of black paint will improve the looks of the metal parts, and enough play should be left so that the paint will not interfere with their free working.

## Jig Has Quick-Clamping Motion

The jig shown in the drawing embodies an interesting quick-clamping motion. The work for which it was to be used was previously finished to a quite uniform width, so that only a very slight motion of the jig clamps was necessary to tighten or loosen the work in the jig. This motion was provided by the use of a small shaft, with two eccentric cams and a wing nut all keyed to it. The eccentrics work in a space hollowed out in the studs, forcing them up or down as the cam shaft is




Two Cams, Mounted on a Shaft, Force the Studs Up or Down, and Tighten or Loosen the Work in the Jig

rotated by means of the wing nut. Thus, one-half turn of the wing nut or less will tighten or loosen the work in the jig.

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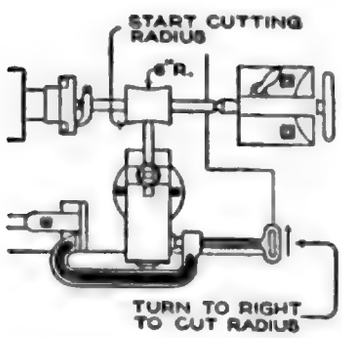
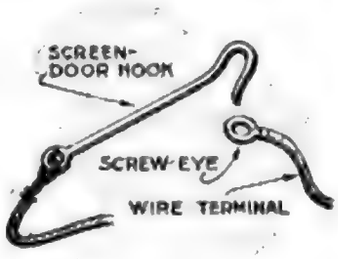
### Feed for Radius Work in Lathe

A simple mechanism for feeding the tool, when a double-curved surface must be machined in the lathe, is shown in the diagram. The work is mounted on an arbor as usual, and the tool is set exactly at the level of the center of the work. The tool post is clamped down only moderately tight; and a large C-clamp grips the rear of the tool holder, as shown. Where a spherical surface is to be cut, use a long tool which has its cutting edge on the farther side of the spindle, and run the lathe backward.



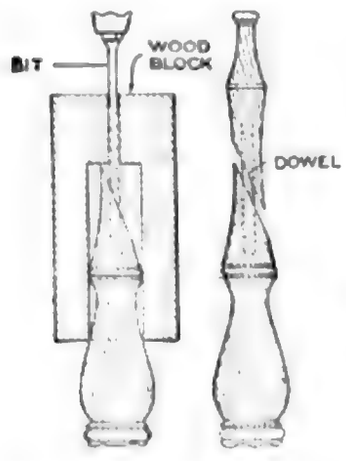

### Screen-Door Hook Forms Switch

For battery circuits carrying currents at low voltage, as used by experimenters, an ordinary screen-door hook forms a quite satisfactory switch.



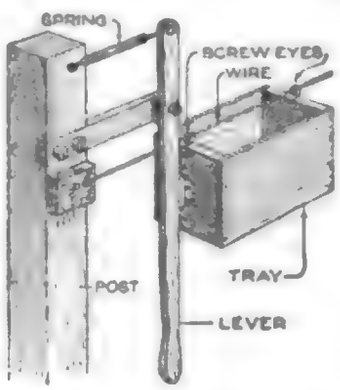

### Repairing a Crippled Table Leg

When a round leg of a fancy table, or chair, gets broken, it usually breaks on an angle, and cannot be glued properly unless a dowel is inserted. Many persons balk at inserting such a dowel so it brings both pieces together evenly, but the following is a simple way of doing it. In a piece of wood, 3 in. square and 8 or 10 in. long, bore a hole in the end just large enough to take the leg, and about 6 in. deep. Remove the bit, and in the same hole continue through with a bit the size of the dowel wood (about ¼ in.). Insert the broken leg; if tapered, wind string around the narrow part to build it up to the diameter of the hole. Then insert the bit from the other end, and the block will guide the bit so that it bores a hole squarely in the center. The illustration shows the arrangement. Then bore the other part of the leg, insert the dowel, and glue. The two parts should fit exactly and be quite strong. This can also be done with square legs.—V. H. Todd, Rainbow Lake, N. Y.



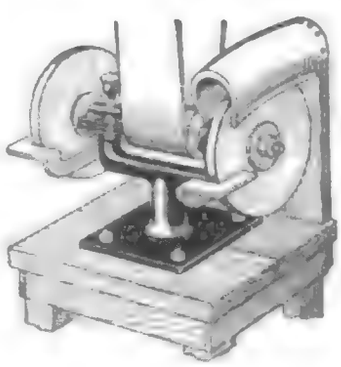

### Message or Small-Tool Carrier for the Shop

The drawing shows a handy spring-actuated device for carrying messages, small tools, or any light articles from the shop, office, or storeroom, to other parts of the building on the same floor. A small box has screw eyes in the upper edges, by which it is hung from the wire. This wire may be stretched between any two convenient points, and should be very tight, so as not to sag. An arm on the post or wall to which the wire is fastened, supports a wooden lever. A spring, such as used to hold screen doors shut, is attached to the upper end of the lever, and to the post. To send the carrier to the other end of the line, pull back the lower end of the lever, draw the box up snug against the lever, and let go. If the carrier is to be used for papers or other light articles, the box should be provided with a cover.—J. Horace Van Nice, Waukon, Iowa.




### Tire Casing Forms Guard for Emery Wheel

Making a guard out of sheet iron to fit an emery wheel entails considerable labor, but an old piece of tire casing needs very little alteration in order to give it the right curve.



¶ For chipping off marble, a wood rasp or coarse file has been found useful.

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# A Successful Homemade Farm Tractor

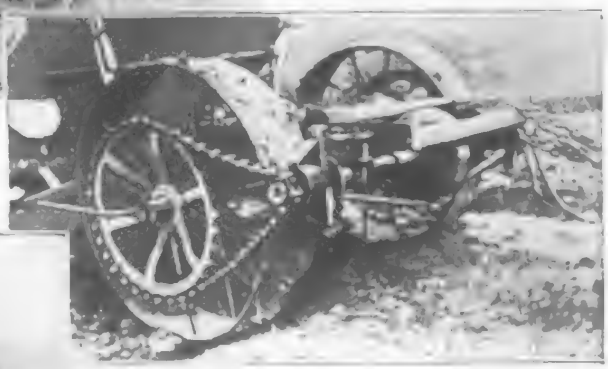
By THOMAS A. LEADLEY

AT an expense of approximately $18 for materials and labor, a Nebraska farmer converted into a tractor a second-hand automobile that had outlived its usefulness as a pleasure car, and for which he paid $125. The tractor pulls a gang plow easily at a depth of 5 in.; in a full day's time it will plow eight acres with a fuel consumption of 1½ gal. of gasoline per acre and 1 gal. of oil a day. The extra equipment used in making this homemade outfit consisted of two small sprocket wheels; a heavy steel shaft, or axle, and two clamps for bolting it to the frame; steel braces; two grain-binder drivewheels with large sprocket wheels attached; two drive chains, and a few bolts, keys, etc. Most of these parts can be found in the junk pile on the average farm.

The converted machine works on the same principle as the tractor attachments for automobiles now on the market, but is much less expensive, and therefore is more likely to appeal to the man with the old automobile that may not be thought worth the price of the manufactured tractor attachment. Many automobiles which have some parts that are worn too badly to stand up under road driving, might be suitable for converting into tractors of this type, in which a good engine and bearings and a stout frame are the principal essentials. In fact, the first cost of the automobile was really a great deal less than $125, for it was equipped with four tires, two of which were almost new. These were valued at about $75, and were transferred to another automobile that the farmer already owned. So, in fact, a machine costing about $70, or less than the price of one good horse, was capable of doing the work of four or five.

The work of converting the old automobile into a tractor was very simple, and could be accomplished easily by any-

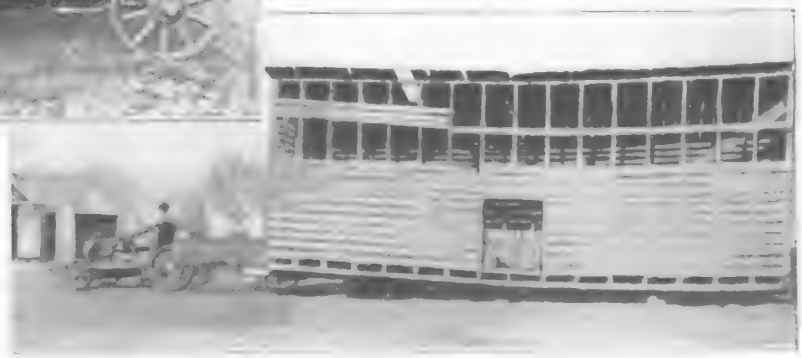
Although Having an Appearance Very Similar to an Ordinary Old-Fashioned Automobile, the Machine Has the True Tractor Characteristics of Heavy Pulling Power and Hill-Climbing Ability, Together with Considerable Possibilities in Covering Rough Ground



The Rear-Axle Shaft of the Car Serves as a Jackshaft, from Which Power Is Transmitted by a Chain to the Large Binder Wheels

PHOTOS BY COURTESY OF ALFRED NOWKA

Above Is a Photograph Which Shows the Braces Built onto the Ends of the Rear Wheels. To the Right, the Tractor is Shown Hauling a 32-Foot Corn Crib to a New Position. This Somewhat Unusual Task was Performed with Entire Satisfaction, and without Injury to the Mechanism of the Tractor



one with the aid of a blacksmith. The two rear wheels were first removed, and the tires were taken off the front ones. On each end of the rear axle a small sprocket wheel was fastened by means of a key. The axle being of the full-floating type, the roller bearings inside the wheel housing were left in. The rear springs were then removed, and the axle was clamped firmly to the frame of the car.

A short distance in front of the rear axle, the heavy steel shaft was bolted securely to the frame, on each side; and on the ends of this shaft were keyed the two binder drivewheels, with sprocket wheels attached. The ends of the shaft were braced to the frame in front with additional steel rods, as the illustrations show. Ordinary binder drive chains were used to connect the sprocket wheels on the rear axle to the large ones of the drivewheels. The fenders and all other unnecessary equipment were removed, and the conversion of the automobile into the homemade tractor was complete. No additional gears were needed, the same differential was used, and all that remained to do was to hitch on the load.

The sprocket wheels gave a gear ratio of 6½ to 1; that is, the sprockets on the rear axle made 6½ revolutions to 1 revolution of the drivewheels. The machine is operated in the field on high gear, or direct drive. At first, larger sprockets were used on the rear axle, and the machine was driven on the intermediate gear, but this method did not prove very successful, so the smaller sprocket wheels were substituted. These are 4 in. in diameter and have five teeth. The sprockets on the drivewheels are 26 in. in diameter and have 33 teeth.

With this gear ratio, the machine moves at the rate of three miles an hour, pulling with ease a gang plow in the field, without running the engine extremely fast or slow. The gang plow is attached to the frame of the tractor in the rear. The absence of the rear springs makes the machine ride somewhat roughly, but springs of some kind could readily be put on to absorb some of the jar, and to lessen the strain on the gearing and frame.

Besides plowing 50 acres up to date, the tractor has pulled a three-section harrow over some of the plowed ground, which shows that the machine will do work on soft ground. It was also used to move a chicken house a distance of one-fourth mile. The building was dragged on the ground, and most of the distance was covered with the machine traveling on high gear. The ground was wet in places, and when such a condition was encountered, it was necessary to shift to low gear. On another occasion, a corn-crib was moved with the tractor, as the illustration shows. The crib was 32 by 10 ft. in dimensions, and was mounted on wheels. It was pulled a distance of 200 yd. The owner of the machine intends to use it also for pulling a grain binder in the harvest field.

Apparently there has been no excessive wear on the bearings and gears, and no trouble has been experienced with the motor, which is a four-cylinder one. One headlight was allowed to remain on the car, and was of use occasionally for late or early plowing. Extra lugs or spikes were bolted to the drivewheels on the outer surface, to give them more traction. The machine thus equipped weighed 2,234 pounds.

While it would not be possible in every case to buy a used motor car as cheaply as in this case, or to get one in as good condition, yet there are many times when used cars can be bought for a small figure and made use of, or when one that is about to be disposed of might be converted into something more useful on the farm. The number of old automobiles increases each year, and a general application of the method followed would help to reduce the number of cars that annually go to the junk pile.

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### Removing Dents from Auto Bodies and Fenders

If sufficient care is exercised, it is possible to make a good repair job of the dents and disfiguring depressions which mar the surfaces of automobile bodies and fenders. Fill a sack made of heavy canvas with builders' sand, and fasten a board to one side of it, so that one side of the bag is soft and one rigid. Place the soft side against the cavity in the sheet metal, and hammer the ridge which corresponds to the cavity on the other side of the metal. Use a rubber-faced or boxwood mallet, to avoid cracking the material, and strike light blows in circles around the damaged part, narrowing the circles gradually until the center is reached. In this way the material will be restored to its original shape, and if the blows are not too violent, there is

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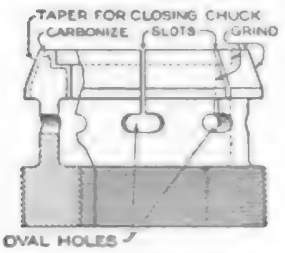
no danger of making a bulge in the opposite direction, as the sand offers sufficient resistance to keep the surface flat. The method of holding the sack in position will depend on the conditions governing each case, but if the car is placed near a wall, the matter will not be difficult.

### Cutting Slots in a Chuck after Hardening

The special chuck shown in the cut was required for holding a job in the turret lathe. It has eight jaws, separated by slots about ⅛ in. wide; these slots end in oval holes, which give spring to the jaws. The surfaces marked "grind" were required to be hardened and ground before the eight slots were cut. This was to insure great accuracy, as the work to be held in the chuck was previously finished on the outside, and only .015 in. was allowed for clamping. The problem of cutting these slots after the work had been hardened was a somewhat unusual one, and was solved as follows:

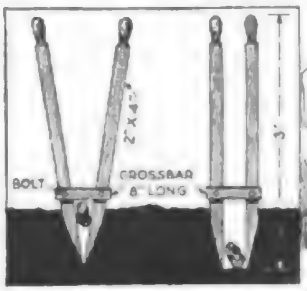



A piece of .40-per-cent carbon steel was used, and was finished all over, as shown in the sketch, except that the slots were not cut, and about .020 in. was allowed on all surfaces to be ground. The oval holes were cut as shown. The piece was then carbonized, as is done in case-hardening, to a depth of about 1/16 in., but instead of being hardened, was cooled slowly to leave it soft. During this process, the threads were protected with fire clay. The slots were then cut to a depth of only 3/32 in. below the surface, so that the jaws were still connected with each other by solid metal. This connecting portion was, however, entirely below the carbonized layer, so that, when the piece was now heated and cooled suddenly, it did not harden as did the carbonized part on the outside.

The proper surfaces were ground to finish, and the slots were cut apart in the milling machine. The other member of the clutch, which has an internal taper fitting against the tapered surface shown, is omitted from the drawing for the sake of clearness. It screws onto the outside threads, shown below, while the inside threads fit the spindle of the lathe.—S. B. Royal, Baltimore, Md.

### A Simple Potato Planter

The owner of a kitchen garden avoided the expense of purchasing a potato planter by making a very serviceable one out of two pieces of wood connected by strips, or crosspieces, of the same material. The illustration shows how the potato is held in the planter, and dropped into position by separating the jaws. The crosspieces should be made strong, so that foot pressure may be applied to force the points of the tool into the ground.




Four Pieces of Wood Make an Inexpensive Potato Planter Which Gives Good Service in the Hardest Soil

### Wick Waters Seedlings

In dry weather, young seedling plants may wilt for lack of water. Yet it is a difficult matter to supply them with moisture in the ordinary way, since the sun dries the water up very quickly. By placing a tub, or pail, full of water at each end of the row, with a wick of soft cotton, or other absorbent material, between them, and lying along the ground at the side of the plant stems, they will receive sufficient moisture with a minimum of attention.—S. Leonard Bastin, Bournemouth, Eng.

**A Length of Cotton Wick Provides an Irrigation System to Supply Young Plants with Water**

¶A cheap glass cutter, dipped in kerosene, does straight work on all but very heavy glass, with satisfactory results.

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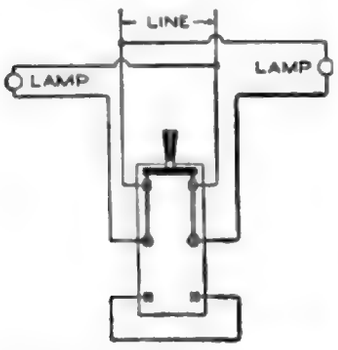
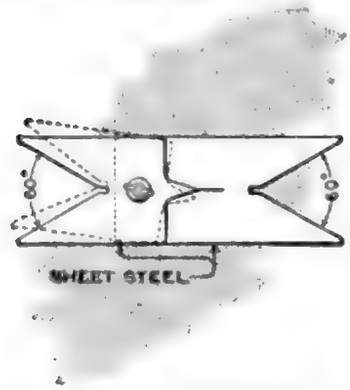
### Series-Parallel Switching for House Lights

The method of dimming electric lamps by connecting them in series instead of in parallel has been widely used on automobiles, but it has also interesting possibilities in house lighting. The diagram shows how an ordinary double-pole, double-throw switch can be connected to two lamps in such a way that, when the switch is thrown to the upper position, the lamps are in parallel as usual, while, with the switch in the lower position, they are in series across the line. It must be understood that lamps burning on half voltage, as these are when connected in series, burn with a very low efficiency, but for occasions when but little light is required, this may not be a great objection. The power used by the two lamps when dimmed will be but little more than one-fourth of what the two use when connected in parallel.—Victor H. Todd, Rainbow Lake, N. Y.




### Test Gauge for Lathe Centers

The cut shows a simple tool which will be of assistance to every machinist who works on a lathe. With it the two lathe centers can be tested for correct shape and position at one observation. The tailstock center is brought up to the proper distance, and the gauge is placed with the two 60° angles fitting over the two centers. Like an ordinary center gauge, it shows the correct 60° shape, and at the same time indicates whether the two centers are in line with each other. If the gauge fits them neatly, but the pointer does not rest upon the center line, it will be apparent that there is an angular error in the position of the centers. The gauge should be accurately made of tool steel, tempered and ground. It will also be useful for testing centers in the milling machine or shaper. For resetting the centers accurately after doing taper work, it may give more accurate results than the marking on the tailstock itself.—S. B. Royal, Baltimore, Md.

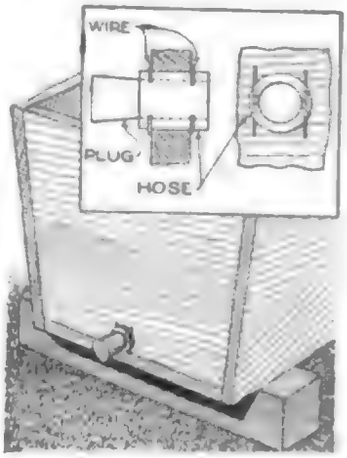



### Securing Asbestos Gaskets

A tight joint can be made in the faulty exhaust-pipe coupling of an automobile by placing a gasket of fine brass-wire mesh between the asbestos gaskets. When the flanges are tightly bolted it becomes imbedded in the asbestos, and prevents it from blowing out.—Joseph Magis, Ouffet, Belgium.

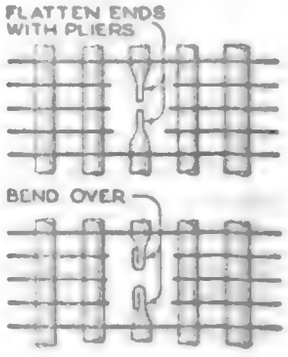
### Rubber-Hose Bushing for Plug

When cutting a wooden plug for a barrel or trough, it is not necessary to spend time in shaping it to make a water-tight fit in the vent, if a piece of rubber hose is ready to hand. Thrust the rubber into the vent, allowing it to project about ¼ in. on both sides, and secure it in position with four nails, or short pieces of wire. When the plug is forced into the hole, the pressure of the tapered handle against the rubber causes the latter to expand, and effectually prevents leakage.—C. A. Black, Jr., Hightstown, N. J.




### Quick Repair for Auto Radiator

An automobile driver found it necessary to do an emergency repair job on a leaking tubular radiator. As he was far from a garage and had no soldering outfit, he cured the trouble with his pliers and a pair of tinsmith's shears, which he always carried. He cut the leaking tube with the shears and flattened the two broken ends with the pliers, after which he bent the ends over, as shown, and stopped the leak completely.—Harold E. Benson, Boulder, Col.

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### Taking Panorama Photographs with an Ordinary Camera

With a little care, the amateur photographer can use an ordinary camera to make landscape views of a width extending far beyond the limits of the visual field. It is necessary to use a tripod, as the picture is composed of a series of views taken from the same point, the angle of vision being changed for each picture. Select the landscape to be photographed, and direct the lens to that part of it which is to appear at the right or left extremity of the panorama. Focus for extreme distance, and expose, after which swing the camera to the next portion of the view, and expose again on another section of the film, repeating the process until the whole of the landscape has been photographed. When prints have been made, trim the edges, and paste them edge to edge on a cardboard mount, so that they form a continuous scene. If this is carefully done, the joints will be hardly noticeable, but the result depends to a great extent upon the judgment shown in using the camera. The views should all overlap, and the joints should be made, if possible, along the vertical outlines of objects in the picture, such as trees or telegraph poles, so that the dividing lines will be nearly invisible, or can be made so with light strokes from a lead pencil. It is, of course, important that the degree of development should be uniform in the different views.

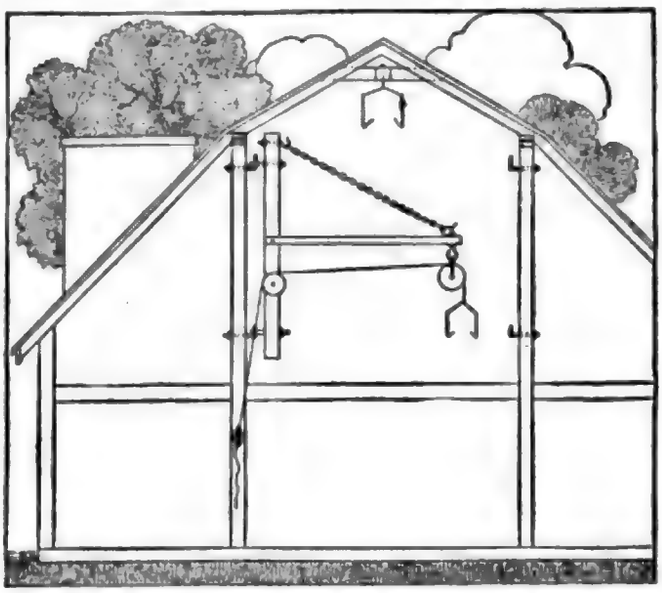
In Joining Prints Together to Get the Panorama Effect, It Is Best to Trim Them along Some Vertical Line in the Photograph

### Trough Prevents Grounding of Spark Plugs by Rain

Water leaking through the hinge of the hood cover on an automobile collects in the depressions around the spark plugs and often grounds them. A galvanized-iron trough, hung from the center rod that extends from dash to radiator, will carry off the water as it collects, and thus avoid the trouble. This trough should be sloped from the cowl down toward the front end of the car, the spout being in front and to the left of the engine. Either wire or iron straps may be used to hold the trough in place.—Harvey Mead, Scranton, Pa.

### Hay Crane Helps in Utilizing Barn Space

The mechanical fork which runs on a track under the ridgepole of a barn is only partly efficient, according to the experience of most farmers. The center of the mow can be filled with it, but considerable work has to be done by hand in storing the hay at the sides of the barn. To eliminate most of this labor, a farmer made an adjustable crane with fork attachment, of the type shown in the sketch. Hinges of the simplest hook-and-eye construction were made in the farm smithy, the hooks being made permanent fixtures on all the posts standing on both sides of the barn driveway. The crane was then hung to the post nearest to the part which was to be filled, and was afterward moved to the other posts by the fork which ran along the roof. The beam of the crane was made to swing over the mow by the weight of the fork, this condition being effected by adjusting one of the hinges off center, so that the upright member was tilted at a slight angle from the vertical.



An Easily Adjusted Crane Enables a Mechanical Fork to Operate in Every Part of a Haymow

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This arrangement also proved advantageous when the barn was being unloaded, as hay is not easily lifted by hand when it has been trampled down solidly in the mow. With the crane, however, it was found possible to move enough feed in 15 minutes to last for several days. —Herbert A. Shearer, Willits, Calif.

### Old Newspapers as Kindling Wood

When a number of old newspapers are used to kindle fires it requires considerable time to crumple them, and if they are left folded they do not burn readily. On the other hand, when crumpled they sometimes burn too quickly. A convenient, quick way, when the newspapers are desired to take the place of kindling wood, is to lay eight or ten single sheets of newspaper, one upon the other, and roll them up in a slender tube, then flatten the tube out and bend it under the fingers, so that a single knot can be tied with it. Pull the knot tight; five or six of these knots laid in the stove grate will ignite the coal as well as wood kindling.

### Poultry Houses on Posts Save Space

Visiting a city back-yard poultry keeper, the writer was surprised to discover that his flock numbered 600 head. His lot was of liberal size, but that was not the explanation, because, ordinarily, it would have seemed a small place for 175 hens. His simple device was the building of poultry houses on posts. The runway of each house was the space beneath it, effecting a striking and obvious economy. The enthusiastic owner told of other advantages. The post feature reduced the outlay for chicken wire; it created an exceptionally dry and healthful pen, and it minimized the rat danger.

Poultry Houses, Placed on Posts above the Runway, Economize Space and Provide a Dry Floor for the Fowls

The principle is adaptable to most styles of poultry houses. A lifted trapdoor in the pen floor gives the hens access to an inclined board, on which cleats are nailed, extending to the ground below. This space is inclosed on two sides with ordinary poultry wire. In the back it is boarded up for protection against wind. Here a door is installed for convenience in removing contaminated surface soil, and substituting fresh material.

It will pay many poultry keepers to elevate their chicken houses on posts. In doing this, one of the main things is to obtain an absolutely tight floor. A double floor, or a floor of matched material, is advisable. A cartload of dry sand spread over the bare floor, then liberal use of shavings, straw, or other good litter material, makes the floor draft-proof and sanitary. The sand should be removed twice a year, and will be found valuable for fertilizer.

To the poultry keeper whose premises are not well-drained, so that at rainy periods water accumulates, the poultry house on posts should make special appeal. Thousands of back-yard flocks are unprofitable because their quarters are damp. Under such conditions, the house on posts should be considered well-nigh indispensable. In some of the commercial poultry districts of the Pacific coast it is employed successfully for this reason.

On the score of appearance, no one could possibly object to the poultry house on posts. With the ordinary back-yard flock, the most unsightly feature is the runway. It can be placed in a subordinate position beneath the chicken house with undeniable profit.—J. T. Bartlett, Ft. Collins, Col.

### Fruit Keeps Better When Carefully Picked and Packed

A certain proportion of the fruit harvest is worthless before it reaches the market, but the proportion is being reduced every year through the efforts of experts. Two causes are given for nearly all the waste that occurs. One is carelessness in handling the fruit, and the other is neglect of the precautions necessary to keep it cool after harvesting. The -

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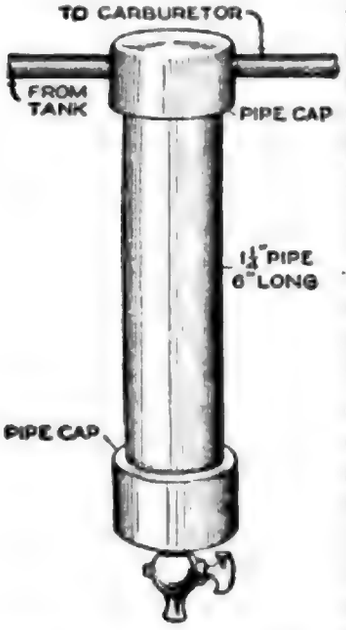
former must be eliminated during each of the three processes through which the crop goes before shipment—picking, grading, and handling. Any injury to the skin of the fruit is likely to cause decay; and to reduce wastage, fruit growers continue to improve the equipment used in these processes. Where fruit is grown on a small scale, it is not possible to make radical changes in organization and material, but considerable saving is insured by increasing the supply of grading tables and picking baskets, and by using care in the selection of trays, crates, boxes, and containers. To keep the crop cool until shipment, special cellars and storerooms are advised, and some provision can be made against transportation risks if the shipper gives personal attention to the condition of the refrigerator cars that are to haul his crop.—F. H. Sweet, Waynesboro, Va.

### Dirt Trap for Gasoline Line in Boat Engines

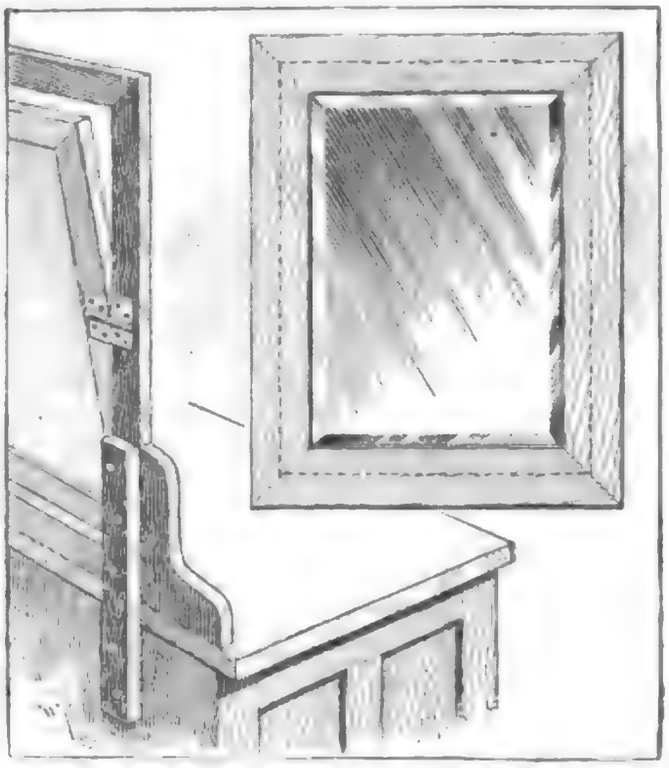
The owner of a motorboat experienced a good deal of trouble through the accumulation of sediment in his gasoline tank, and to prevent the frequent choking of the needle valve in the carburetor, and also to prevent flooding, he installed a trap in the feed line between the carburetor and tank. It consisted of a wrought-iron pipe, with a cap at the upper and lower ends, the upper one being drilled and tapped to take the feed pipe on both sides. The lower cap was tapped to take a ¼-in. petcock, with which the trap was carefully drained before making a trip. No screen was used, as the engine was only of moderate size, so that the flow of fuel was slow enough to permit dirt and water to sink into the well between the separated ends of the feed pipe.—Wm. F. Crowell, Providence, Rhode Island.




¶When no other supply is available, resin taken from knots in pine boards may be used in soldering a tin roof.

### Changing a Rigid-Frame Mirror to a Tilting-Frame Type

A plain mirror was converted, by the addition of two friction hinges, into a tilting mirror, which was mounted on a low dresser, thus forming a much more useful article of furniture. By means of a gimlet and a keyhole saw, the cuts were completed through all four sides of the mirror frame; the inner part containing the mirror was then removed, and the sawed edges dressed and varnished. The friction hinges, which were obtained for a few cents from an upholstery store, were mounted behind as shown. Two pieces of hard wood were shaped to form the curved brackets at the sides, and upright cleats were fastened securely with screws to the back of the mirror and the dresser. The cleats held the mirror in place, the curved pieces being merely for ornament.—W. B. Gray, Louisville, Ky.



By Sawing through All Four Sides of Its Frame and Mounting Friction Hinges, a Straight Mirror was Converted into a Tilting One

### Horse Muzzle for Hanging Basket

A hanging basket for flowers may be quickly made by adding a handle, made of three wires meeting at a hook, to an ordinary horse muzzle. The basket is lined with moss, dirt put in, and the flowers planted. It is then ready to hang, and makes as neat an appearance as a manufactured basket.—Chas. A. Black, Jr., Hightstown, N. J.

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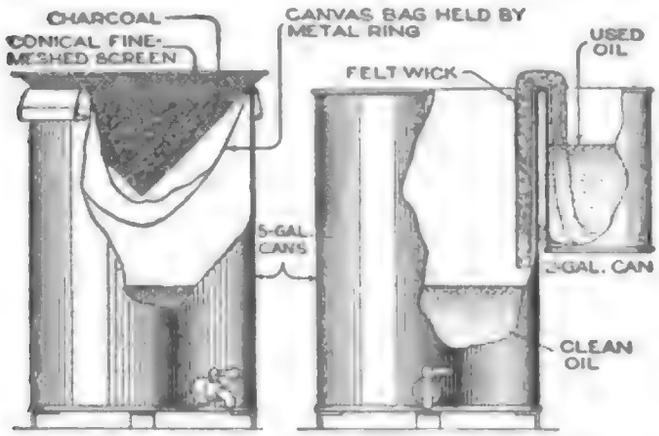
## Oil Filters for Garage Use

It is well known that smooth operation and long life of automobile-type engines are promoted by draining the crank case at regular intervals and renewing the oil. If the old oil is thrown away, however, it




**Filtering the Oil Which has been Removed from the Auto-Engine Crank Case Makes It Almost as Good as New**

represents a considerable waste. Filtering this oil for the removal of particles of grit, metal, and carbon is a practical process which can be accomplished without any expensive apparatus. Two methods are illustrated, these having been selected from several which were found in use in large auto-repair shops.

The method shown at the left is used in quite a large shop, where a dozen cars are drained daily, making the item of oil saving one of considerable importance. The apparatus consists of a cone-shaped canvas bag, supported by a metal ring thrown over the top of a 5-gal. can. Inside of the canvas, separated from it a distance of about 1 in., a fine wire-mesh screen of similar shape is used as a container for broken charcoal, such as is sold for use in kitchen ranges. Filtration by this means is rapid, being about 2 or 3 gal. each hour. The charcoal acts as an absorbent, gathering the grit, wax, and dirt from the oil, and the wire mesh and canvas also assist by catching certain kinds of dirt which do not adhere to the charcoal. The filter is emptied every other day, and washed out in gasoline.

The second type of filter is even less expensive, though the operation is very slow. One large can, of 5-gal. capacity, receives the oil after it has been filtered by working through the felt wick leading from a smaller can, attached in the position shown. The felt wick is made up of several long strips of felt, such as used for gaskets around crank cases and the transmission. The wick should dip some distance into the used oil, but the other end should hang down so as to reach a lower level than the bottom of the small can. The oil works up into the wick by capillary attraction, leaving the dirt behind. Gradually, it soaks through the other end of the wick, where it gathers into drops and falls to the bottom of the large can. After as much oil has filtered from the small can as will separate itself from the dirt, the remainder is thrown out, and the can is cleaned with gasoline ready for filtering a new lot of oil. It is necessary occasionally to immerse the wick in gasoline for cleaning, or to substitute a new wick.

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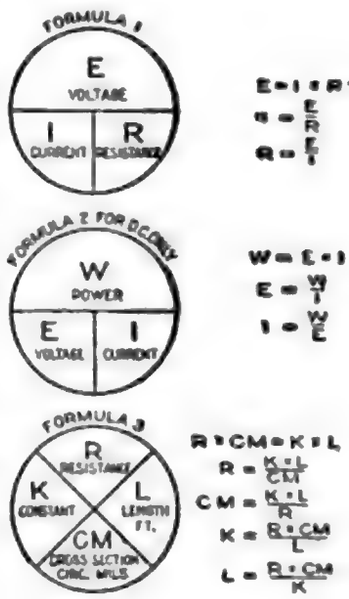
## Diagram Facilitates Remembering Electrical Formulas

Formulas which an electrician has to use very frequently in his work can be written in a form which makes them much easier to remember than the ordinary mathematical expressions. Three of these formulas are shown in the diagram, expressed in the usual ways at the right, and embodied at the left in the circular form. The principle of these circles is that the product is balanced or set against its factors. In the first formula E is the product, and I and R are the two factors. By dividing the product by either factor, the other one is obtained. The circle is merely a visual method of remembering this relation. The same holds true, in formula 2, of the power, voltage, and current. W being here the product, and E and I the factors. (It should be noted that formula 2 applies in direct-current work only.) Formula 3 refers to the resistance of a piece of wire in relation to its dimensions. The ordinary form of this formula is the second equation given, and means that the resistance of a piece of wire is equal to the length in feet multiplied by a certain constant number, K, divided by the area of the cross section, which is expressed in circular mils, or circles .001 in. in diameter. In this case,

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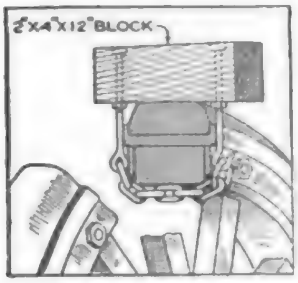
R multiplied by CM is equal to K multiplied by L; that is, the products of each pair of factors opposite each other are equal. Any of the four factors may be found by multiplying together the two to the right and left of it, and dividing the result by the one opposite. Thus, if the relation of these four symbols in the diagram can be fixed in the mind, it is not necessary to remember any of the formulas themselves. The number K is the resistance of a wire 1 ft. long and .001 in. in diameter, as given in electrical handbooks; for soft copper, it is about 9.6.—Geo. W. Lord, Philadelphia, Pa.

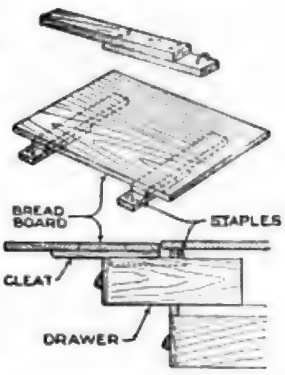
### Mud Hook for Auto Trucks

A lumber dealer, who used motor trucks to haul his loads, found that nonskid chains and traction lugs were sometimes insufficient to extricate a mired truck. For such cases he used a block of wood, which he attached to the felloe of the wheel by means of a chain, eyebolt, and hook. Only one block is needed on each driving wheel. If one is particular about the appearance of his car, a piece of rubber hose may be used on the chain to protect the finish on the felloe and spokes.—Stanley R. Booth, Sistersville, W. Va.




### Table Supported on Open Drawer

In a very small apartment kitchenette, the occupant contrived to save space by arranging a little breakfast table, consisting of a device to fit into an opened drawer, as shown. The drawer was opened far enough so the cleats fitted in them, the staples hooking under the face board over the drawer. The drawer was pushed in far enough to touch the outer end of the bottom cleat. One pair of cleats was placed in each side of the drawer. A common bread board was then laid across the cleats, and the result was an excellent table for a light breakfast, or some extra table space for doing the kitchen work. There is nothing to prevent fastening the board permanently to the cleats, as the whole can then be removed upon pulling out the drawer slightly.—L. B. Robbins, Harwich, Mass.




### Wiring Insulators from Inner Tubes

The electric wiring on a car body may be insulated when installed by putting pieces cut from old inner tubes under the heads of the double-pointed staples used to hold the wires in place.

### Park Entrance Made of Plain Lumber

The gateway here shown was very economically constructed by using lumber supplied in standard dimensions. The uprights are 4 by 4 in.; the lower crosspieces and fence rails, 2 by 4 in., and the fence spindles and upper crosspieces of the gates, 2 by 2 in., as are also the short horizontal strips which extend at right angles between the crosspieces, to support vines over the archways. The arches are made of basswood, which is easily bent into shape after being soaked overnight in water. The structure was painted white, with the exception of the fence spindles, which were given a brown tone; but the color scheme in such a case depends on the surroundings. At very slight expense, a gateway of this kind greatly improves the entrance to a farm, a small park, or even a private residence. The example shown stands at the side entrance to a large park, to serve until the development of the neighborhood will make possible something of a more substantial nature.

By Using Cheap Lumber, an Ornamental Gateway is Erected at the Entrance to an Undeveloped Park, at Trifling Cost

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# Installing Shop Motors on the Ceiling

By H. T. BOYNTON

THERE are many methods of raising an inverted motor to a location on a ceiling, but the one outlined herein will be found unexcelled under certain conditions. Fig. 1 shows how the tackle is

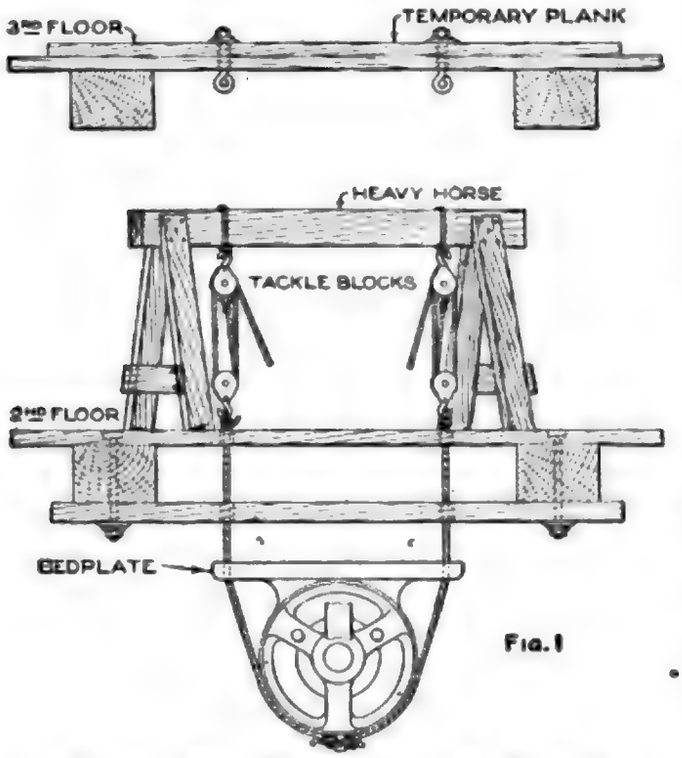


Fig. 1

**The Tackle Blocks are Attached to a Horse, Set Diagonally, or, Better in Many Cases, to Eyebolts in the Next Floor Above**

arranged, and Fig. 2 gives a plan view at the second floor. The inverted motor is raised with two ropes, each of which passes through a foundation-bolt hole in the bedplate, is arranged around the motor frame, and made fast in the eyebolt at what is normally the top of the motor. The two holes in the bedplate are located at diagonally opposite corners. The hoisting ropes, after being made fast to the motor, are threaded through two of the four holes which have been bored to accommodate the bolts in the stringer pieces which will support the motor. Then the ropes are carried through two accurately located holes in the floor above. On this floor rests a horse supporting the two sets of blocks with which the motor is raised. As indicated in the drawings, the horse is arranged diagonally so that it is directly over the two holes in the floor through which the hoisting ropes pass. Sometimes, instead of using a horse to support the tackle, it is better to arrange temporary eyebolts in the floor of the story next above, as shown at the top of Fig. 1. They can be readily removed after the motor has been raised, but can be quickly relocated when the motor must be replaced or taken down.

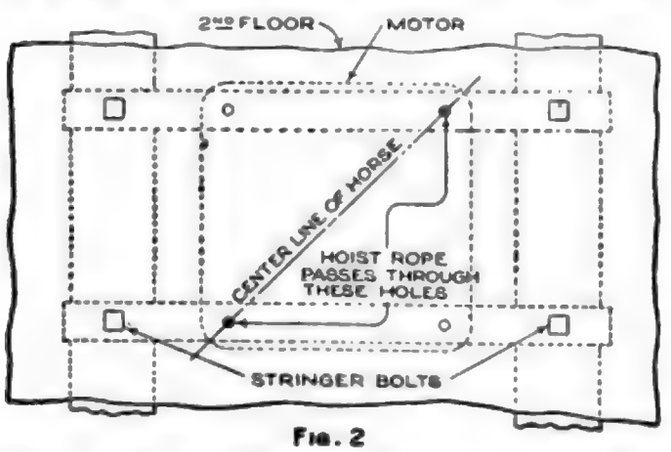


Fig. 2

**Using Only Two Holes for Hoisting, Leaves the Other Two for the Bolts to Hold the Motor While the Ropes are Unfastened**

After the motor has been raised to its position on the stringer planks, two bolts are inserted through the open holes, and set up tightly. Then the hoisting ropes are pulled out and the other two bolts are inserted.

It should be noted that, with this method, it is not necessary to cut any large holes in the floors. The stringer pieces having been bolted to the beams, the four holes, two in each stringer, for the four motor-supporting bolts, are located and bored in them. These holes should be at least ⅛ in. greater in diameter than the diameter of the supporting bolts. Then the two holes for the ropes are bored through the floor above. If a bit long enough is available, this is easily done by using the holes in the stringers as guides and boring with the lower end of the bit through one of them. If no long bit is at hand, the locations of the floor holes can be accurately determined with a plumb bob, as shown in Fig. 3. The floor holes should be generously large, so that they will not bind the hoisting rope. When buying a motor for inverted ceiling mounting, select one which has a single bedplate, instead of two slide rails, as it is much more difficult and

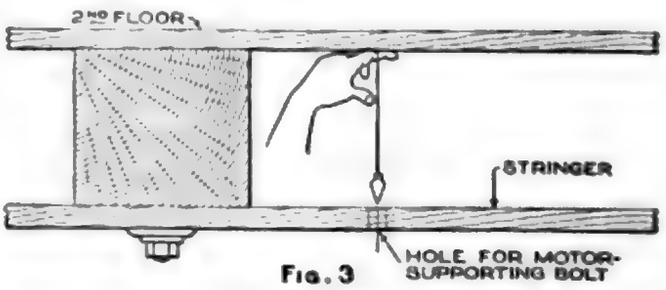


Fig. 3

**For Locating the Floor Holes above the Bolt Holes in the Stringers, a Plumb Bob Is Useful**



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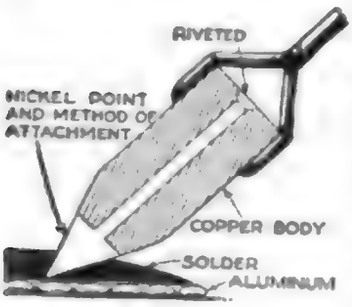
tedious to line up and level two slide rails than one bedplate. Furthermore, the slide rails will require at least twice as many supporting bolts as the bedplate.

### Nickel-Pointed Soldering Copper for Aluminum Work

Owing to surface oxidation, it is difficult to make solder adhere to aluminum surfaces, but if the soldering copper is furnished with a nickel tip, the operation can be performed quite successfully.




Place the molten solder on the aluminum surface, apply a small quantity of acid flux, bring the copper to an intense heat, and thrust the tip through the solder. Work the copper back and forth, so that the hard nickel tip will scrape away the oxidized surface, and the solder following in the path of the tool will adhere to the aluminum before the air can strike it and oxidize it afresh. It is important that the surface should be completely covered with solder before the scraping process is begun; otherwise the penetrating air will renew the oxidation.

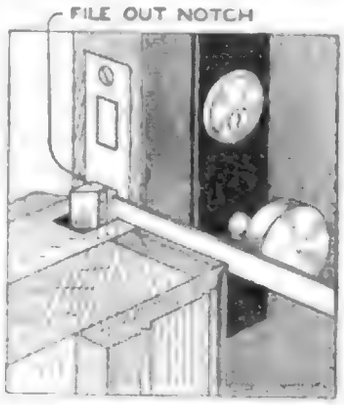
To unite two pieces of aluminum which are already coated with solder, it is only necessary to bring the surfaces together, and to use a little flux and a hot iron. The coating will then fuse without permitting air to penetrate and oxidize the aluminum underneath.—G. A. Luers, Washington, D. C.

### Drawing on Glass with Ink

Blueprints from drawings made on glass are more distinct and show greater contrast than those made from tracing cloth. For classified factory records it is, of course, out of the question to use glass, but in special cases, when it is necessary to make very clear prints of small size, a glass drawing is preferable. The surface does not take ink readily, but when treated with a preparation of rosin and turpentine it gives no difficulty. Fill a half-pint bottle with gasoline, break up a 1-in. cube of rosin, and let it dissolve in the bottle. Then paint the surface of the glass with the solution, and when it is dry proceed to make the drawing with ordinary India ink.—William Grinstead, Columbia, Mo.

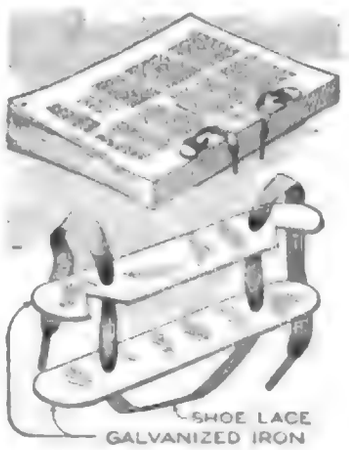
### Notching a Lock Makes It Harder to Pick

Some night latch locks are virtually useless for keeping out the skilled burglar, for the reason that such locks can be opened by any skilled lock picker with a putty knife, or any other thin-bladed instrument. About all one has to do to open such a lock is to thrust the blade between the door and the jamb, pushing the latch inward and unlocking the door. But if the latch has been filed, as indicated in the accompanying sketch, the blade cannot reach the beveled portion, and in consequence the door cannot be so easily opened without the key.—J. E. Hogg, Los Angeles, California.




### String-and-Metal Paper Clip

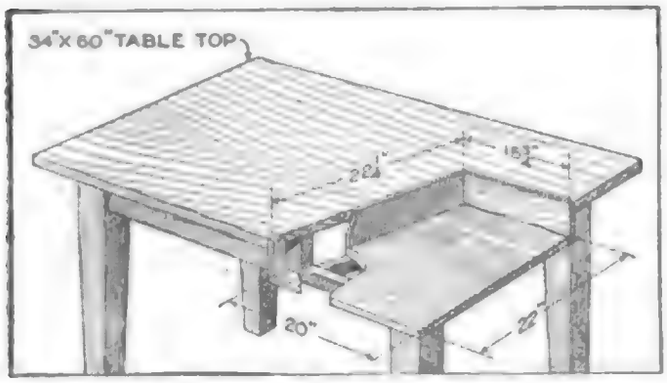
For filing away papers and magazines, a neat and very inexpensive arrangement is made from two strips of galvanized iron and a shoestring. The two strips may be cut out with a pair of snips, and should be about ½ in. wide and 6 in. long. Punch holes ¾ in. from each end, and in one piece cut, or file, V-notches near each end. After a new magazine has been added to the file, pull the string tight, and wind the ends around through the notches in the ends of the upper strip. This will give quite a strong fastening, and it is a matter of only a few seconds to loosen it to add the next magazine.—T. T. Templin, Paris, Ky.




¶ A suitcase is an awkward object to carry on a crowded street. It may be made much easier to handle in a crowd by adding an extra handle placed on one end. This enables the owner to carry the suitcase end up, thus occupying as little room as possible.

### Table Desk for Calculating Machines

Adding machines are now so generally used in commercial houses that desks constructed to hold them are becoming neces-

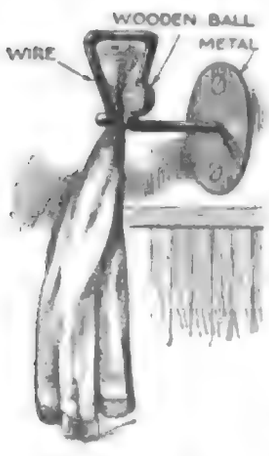



A Simple Carpentering Job Transforms a Cheap Table into a Handy Desk to Hold an Adding Machine

sary articles of office furniture. It is possible, however, to use an inexpensive table for the purpose by making a few simple changes. Cut away a portion of the top, as shown in the sketch, and, after removing part of the horizontal frame which supported it, fasten it in position again about 3 in. below its former elevation. In this way the machine can be kept on the operator's right side, with the keys at a convenient level, and the rest of the table can be used for the records in which the totals are being entered. By observing the dimensions, it will be seen that the machine is set at an angle to the edge of the table, so that the keyboard is turned toward the operator.—M. G. Adair, Los Angeles, Calif.

### Ball-Clamp Towel Hanger

By using a hanger of the type shown, the danger of tearing a towel is much reduced. It is made with a small metal plate, a piece of 3/16-in. rod, and a wooden ball, with a hole bored in it so that it will slide freely on the wire. Cut a groove in the back of the plate before screwing it to the wall, bend the small portion of the wire that projects on that side, press it down into the groove, and flatten it with a hammer. This will make the wire flush with the plate, and prevent it from turning in the hole.—Violet Johnson, Rockford, Illinois.

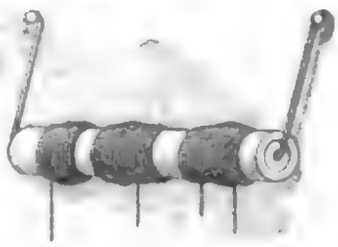



### Drilling Drain Holes in Auto Axle

Melted grease which escapes at the end of an automobile-axle housing is likely to fall upon the brake lining, but can be prevented from doing so by drain holes drilled in the housing a short distance from the hub. A ¼-in. hole is about the right size. Jack up the axle about 1 in., and mark the lower surface of the housing with a center punch at the point where the hole is to be drilled, placing a breast drill, pointing upward, on a block beneath it, with the point of the drill in the punch mark. Let the axle down gradually while operating the drill until the hole is made. This method of keeping grease off the brake lining should only be used when no other cure is possible, as there is always a possibility that dust and dirt may find their way into the housing through the hole. Much of this dirt will, however, flow out again when the grease in the housing becomes hot.—Anthony Ottis, Bloomington, Ill.

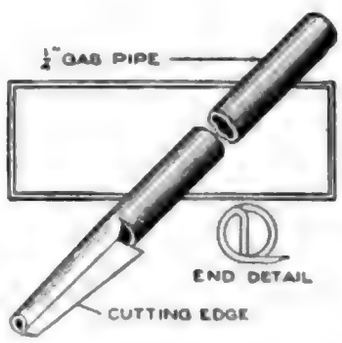
### Strings Kept on Old Handle

A handle of this type can be readily used as a holder for pieces of string, these being rolled up on it very quickly.



### Tool Bores Deep Holes in Wood

When a long hole of large diameter was to be bored in a pattern, the tool illustrated was devised. First, a piece of ¼-in. gas pipe was split down the seam for about 1¼ in.; then one side of the split was bent in toward the center, to remove the chips, the other side being bent out to form a lip to do the cutting. This lip was drawn to a keen edge with a smooth file; it may be casehardened if the tool is to be used often. This makes a very cheap and satisfactory tool; to forge one out complete would be a comparatively expensive and very slow method.—George Ebelhare, Norristown, Pa.

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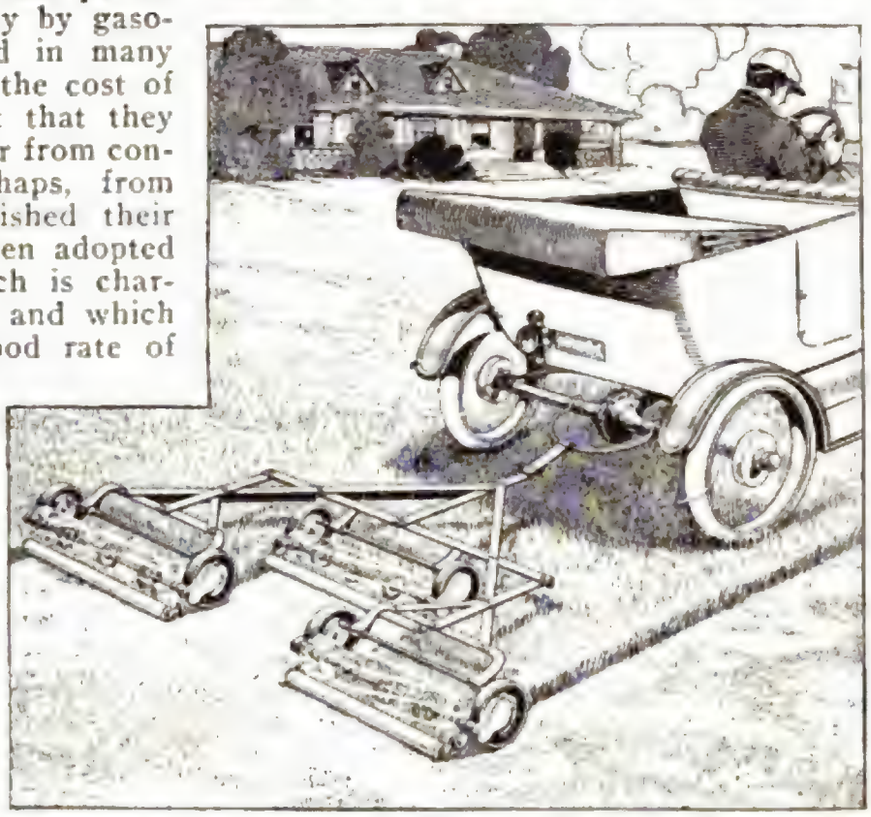
## Lawn Mowers Drawn by Light Automobile

The cutting of grass in large parks and private grounds, golf links, and other places where a neat appearance is desired, is a problem for which various solutions have been offered. Specially built power lawn mowers, operated usually by gasoline engines, have been used in many places with good results, but the cost of these machines, and the fact that they are often subject to heavy wear from continual high speed and, perhaps, from faulty springing, have diminished their usefulness. A method has been adopted for use on a golf links which is characterized by great simplicity, and which does the work at a very good rate of speed. Three wide lawn mowers are attached to a steel frame, as illustrated, and the whole is attached to the rear of an ordinary light automobile. The two mowers at the side overlap the central one by a few inches, to insure covering the swath completely. As the automobile did not have to be provided especially for this purpose, but was required for other purposes, for which it could be used when not engaged in drawing the mowers, the first cost of the apparatus is very low, consisting of only three mowers and a few pieces of angle steel. There is nothing to get out of order, beyond the mechanism of the automobile itself, and the mowers require no attention except sharpening and oiling. A swath about 10 ft. wide can be cut. The device is, of course, best adapted for use on large areas, where there is plenty of space for cutting rounded corners.



The Three Mowers, Held in a Fixed Position to Each Other by the Angle-Steel Frame, are Drawn by the Car at a Very Good Speed and Cut a 10-Foot Swath

### Pinion Machined on a Shaper

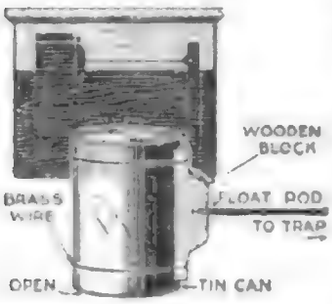
When a mine pump broke down, and emergency repairs became necessary, a pinion had to be replaced. The mine would fill up with water before a new pinion could come from the nearest supply point, so it was necessary to make one. The only machine available was a good shaper, and it was accordingly pressed into service. The pinion to be replaced was somewhat wider than the gear it meshed into, and consequently the teeth on one edge of it were not worn at all. When the blank for the new pinion had been turned up, it was forced on a mandrel, together with the old pinion. The mandrel was then mounted on the V-blocks on the shaper table, and clamped securely. The old pinion was used as a template to cut the new one, and the mandrel was revolved to the proper position for cutting each successive tooth with the shaper tool. Two cuts were made for each tooth—one with a parting, or cutting-off, tool, which removed most of the metal, and one with a side-cutting tool, slightly rounded at the point and ground to fit the side of the tooth.

In this way the breakdown, which had occurred at 4:00 p. m., was ended at 9:30 the next morning, and the new pinion ran with scarcely any more noise than the old one had been making.

¶A handle for a door which opened upward was made from an old shovel handle. The handle was cut off the shovel near the grip, and bolted to the door at a right angle, the bolt head inside the grip circle.

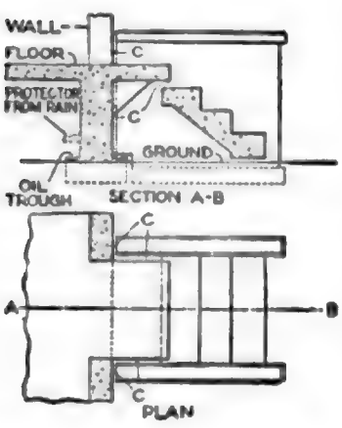
### Tin Can with Open End Forms Emergency Float

A flat dweller made an effective repair job in a toilet tank by using an ordinary tin can. The float ball had become full of water, and sank to the bottom of the tank, so that the escape valve was kept permanently open. He substituted a small can for the ball, and attached it to the float rod by screwing the latter into a piece of wood which he fastened with wire to the can. The can was then placed in the water with the lower end open, so that it sank a short distance, and then floated like a diving bell, due to the presence of the air at the top. In this way the plunger at the other end of the rod was made to close the valve as effectively as when the float ball was in use.




### Houses Made Proof against Ants and Insects

In many tropical countries, ants are a constant plague, and several methods have been devised to prevent them from entering buildings. One of these, familiar in the Canal Zone, is shown in the drawing. It consists of separately constructed steps and wall cheeks, which do not come in contact with the building, but leave openings, C, between. Small oil troughs in the foundation footings prevent the ants from passing there. The construction is very simple, and may be carried out in a variety of ways, according to the architectural layout. The floor of the building projects in the form of a cantilever at the top of the steps, and is slightly narrower than the steps below, so as to leave openings on each side. The troughs in the footings must be kept filled with oil, and all vegetation must be kept away from the walls and steps; it is necessary, also, to keep the gaps free from small articles and rubbish, which might bridge them.




### Methods for Preserving Eggs without Refrigeration

Air which penetrates the shell of an egg carries destruction with it, so that processes by which the shells are made airtight are of great importance to the work of preservation. Different chemical preparations are used in coating the shells, and before they are applied it is advisable to cleanse the surfaces thoroughly. A rag dipped in chloroform is very effective for this purpose.

Among the best materials for coating eggs are paraffin wax, sodium silicate, and beeswax. If paraffin is used, melt the wax to a liquid, and dip the eggs one at a time, using an iron spoon. The sodium-silicate method is a little more complicated, as a certain portion of the chemical must be dissolved in boiling water until a rich, sirupy solution is obtained. Use three parts of water to one of silicate, and leave each egg a few minutes in the mixture, which should be quite hot. If beeswax is used, melt it in a dish over a gentle fire, and then mix it with olive oil. Four ounces of wax to eight of oil will be sufficient when the eggs are dipped one at a time.

With the boric-acid and quicklime treatments, no coating is applied. When using quicklime, mix 12 oz. with each gallon of water, adding 6 oz. common salt, 1 dr. soda, ½ dr. saltpeter, ½ dr. tartar, and 1½ dr. borax. Pour a quantity of the mixture into a barrel until it is a few inches deep. Put in a layer of eggs, pour quicklime over them, and place another layer of eggs above. Continue until the last layer of eggs is about 8 in. from the top of the barrel, fill the remaining space with quicklime, cover it with a cloth, and scatter lime upon it. The boric-acid treatment is a little simpler. Put five or six eggs at a time into a piece of netting, and plunge them for a moment into a boiling solution of boric acid and water. Bacteria are killed by the boiling acid, and the shell becomes strengthened with a thin layer of coagulated albumen. —S. Leonard Bastin, Bournemouth, Eng.

### Chalk Used When Filing Lead

When filing lead, or other soft metals, it is well to rub a piece of chalk over the file before commencing work. The chalk prevents particles of metal from filling the file teeth. To clean the file, tap it against the workbench, and the filings will fall out.—J. N. Burns, Buffalo, N. Y.

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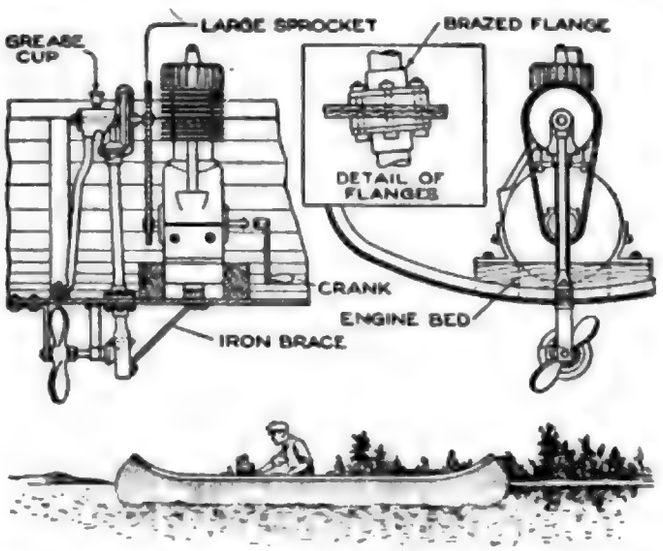
# A Power Plant for the Canoe

By L. B. ROBBINS

A CANOEIST who can pick up an old chainless bicycle and a low-powered engine of suitable size and weight, such as a single-cylinder motorcycle engine, may easily make himself the possessor of a power-driven canoe. The illustration gives an idea of how this may be accomplished. No attempt has been made to give dimensions, as the style of canoe, engine, and bicycle will necessarily determine the details. The propelling mechanism is patterned closely after the average outboard motor in operation. It has the advantage of being very inexpensive.

The power is transmitted by a chain drive from the crankshaft of the engine to the bicycle crank, which is mounted in its hanger, forming the upper part of the transmission. Here the bevel gears from the chainless bicycle carry the power downward through the bottom of the canoe to the propeller shaft, to which connection is made by the small bevel gears taken from the rear hub of the bicycle.




The Driving Mechanism of an Old Chainless Bicycle can be Used for Fitting a Propeller to a Canoe

Saw off the rear forks of the bicycle, so as to remove the sprocket hub, the rear-gear housing, and shaft tube. The parts used consist of the driving gear, and that part of the frame which holds and contains it.

About 6 in. above the rear housing, where the rear-hub spring projects, saw the shaft tube in two parts. Before doing this it will be well to remove the driving gears and the shaft at each end. A wide flange must then be brazed, water-tight, to each section of the tube. An amount of tube must be removed before these flanges are brazed, sufficient to compensate for the added thickness of the two flanges and the bottom of the canoe, not including the keel piece. The flanges will be much more easily brazed at right angles, and since the tube will most likely have to project through the bottom of the canoe at an angle to it, it may be necessary to insert wooden angle shims, as shown in the detail, which must be fitted so as to be water-tight.

Remove the pedal hanger from the sprocket gear, and fit a steel shaft in its place, plugging up the unused end of the hub. The projecting end of the shaft should then be fitted with a large chain sprocket. Insert a grease cup over the main driving gears in the hub. Cut down the opposite fork, and flatten and bend the end, so that it can be bolted to the floor in line with the upper flange, and will act as a brace.

Next, bore a hole in the center of the bottom of the canoe at the desired point, removing about 6 in. of the keel piece at that point. Make the hole the same diameter as the inside of the shaft tubing. Reassemble the shaft and gears in the longest tube and set it in place in the canoe by bolting down the brace. This will set the upper flange over the hole. Then attach a suitable propeller, 8 or 9 in. in diameter, to the rear hub shaft in the rear housing. Set the short end of the tube on the bottom of the canoe, to fit the hole, and bolt the two flanges together, using rubber gaskets

under each flange to render the joint water-tight. Then set up the bevel gears of the under housing in their proper place, and replace the rear housing. If this housing does not furnish a suitable bearing in itself for the propeller and shaft, an auxiliary brace, to support the outer end of the propeller, can be attached to the keel, as shown, in the sketch. An iron brace, bolted to the propeller housing and to the keel as shown, will give additional strength. Any light single-cylinder motorcycle engine will provide sufficient power to turn this propeller.

The method of mounting the motor as illustrated is only suggestive. It will be necessary, in the first place, to provide a pair of heavy wooden blocks to which the motor can be bolted. The blocks can then be fastened to the ribs of the canoe with angle irons to keep them in position. Arrange a crank and pin on one end of the crankshaft, and a small sprocket on the opposite end, which will come in line with the large sprocket on the gear shaft. Connect these sprockets by a suitable chain. Gasoline tank, accessories, and controls can then be placed at suitable and convenient points along the inside of the gunwales. Make every effort to keep the weight as low as possible, to insure steadiness. The difference in the size of the two sprockets will, of course, determine the number of revolutions of the propeller when the motor is running at its average speed.

### Photographing a Person "Floating in Air"

Pictures can be taken of persons while they are in mid-air, using ordinary cheap cameras, though some judgment is necessary. The photograph shows such a snapshot, made with a single-lens, fixed-focus, vest-pocket-size camera. The light must be good, even better than for an ordinary instantaneous exposure. Place the person to be snapped on a fence, porch railing, or other convenient place, at least 5 ft. above the ground. If possible, there should be a light-colored background, as in the photograph, so that the clothing of the subject will contrast with it. Point the camera at the feet of the subject while he is standing on the railing. Then count 100, 200, 300, 400 just rapidly enough to say the words distinctly. The subject must jump when 300 is spoken, and the shutter is snapped at 400. This should give time for the subject to be in mid-air. The result naturally depends on conditions, but with ordinary care, good light, an exposure of $\frac{1}{25}$ second, and a fairly good camera, the trick should not be difficult.

### Lantern Slides from Paper and Magazine Pictures

It is possible to make lantern slides, without going to the expense of photography, by transferring newspaper or magazine illustrations to the glass. The articles needed are some old camera plates, a glass cutter, transparent varnish, some transfer solution, which can be made cheaply at home, and the illustrations. To make the transfer solution, dissolve a bar of soap in 1 gal. of hot water, and add 1 pt. of turpentine. Let it stand overnight, stir well, and bottle.

Then cut a camera plate to the size of a standard slide, wash off the emulsion, and apply a coat of transparent varnish to one side. When this has dried, cut a picture the same size as the slide, and apply a coating of the solution to its face with a soft brush. Place the print, face downward, on the varnished side of the glass, and rub the back of it with the hand. Take the print off the slide, and it will be seen that the picture has been transferred.

To color the slide, use oil paint, but apply only a thin coat, as oil colors are not so transparent as aniline, and the latter cannot be used satisfactorily on a varnished surface. The color will take a day or two to dry.—William T. Grinstead, Columbia, Mo.

### Camping Hints for the Beginner

The pleasure of a camping trip depends so much on the baggage carried for clothing, food, and equipment, that judgment shown in listing the articles makes as much difference as the choice of the location. For provisions, take as much

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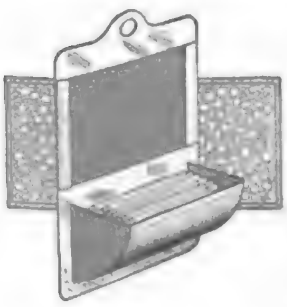
canned food as possible, depending for fresh meat on the fishing line and rifle. Sufficient variety will be found in canned soups, fruit, and vegetables; a ham, a rasher of bacon, coffee, condensed milk, sugar, pepper, salt, cornmeal, flour, potatoes, onions, cookies, crackers, and butter. Cups and plates should be of tin, and for cooking, take a frying pan, a small gridiron, two kettles, two iron pails, and two coffeepots. For fishing, take a heavy trolling rod with 100 yd. of trolling line, and spoon hooks, carrying a light rod for casting, and bait hooks with flies, if the camp is near a trout stream.

The important part of a camper's clothing is underwear, a spare winter suit being indispensable, as well as a sweater and several pairs of stockings. The tent should be of the wall pattern, as it gives more room than the conical type, though it takes a little longer to pitch; and unless the location is on rising ground, be careful to dig a trench around it for surface drainage. Tent poles can be improvised on the camping ground, but carry a rubber blanket to sleep on and several blankets for covering. To build the cooking fire, use a large, flat bowlder for the back of the fireplace, with the front facing any lake or open space from which a breeze is likely to blow, and build the sides 5 ft. apart by piling stones rather more than 1 ft. high. These will support green sticks laid across them to hold the frying pan after the fire has ceased to blaze and come to a red glow. A pot for boiling can be hung from a horizontal stick supported by two forked uprights.—F. H. Sweet, Waynesboro, Va.

### Wire-Mesh Scratcher on Match Box

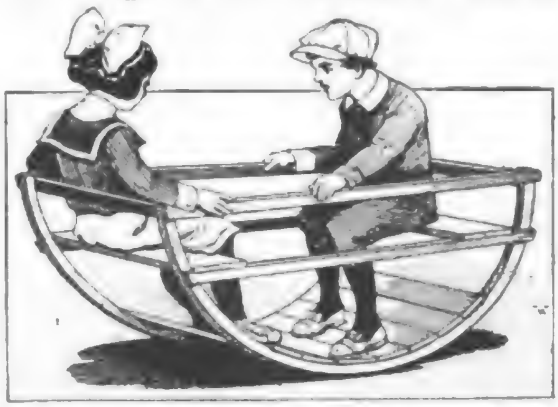


A small fine-mesh wire screen makes a more durable match scratcher than the sandpaper kind, which wears out in a short time. The screen is soldered to the box.

¶When caterpillars become a pest they can be burned from trees very easily by using a pole with some wire screening on the end of it, formed into a cone-shape, and containing a piece of lighted cloth soaked in kerosene.

### Toy Rocker for Small Children

A farmer used a worn-out wagon wheel to make a rocker for his children, and found that it gave them more pleasure than a swing or rocking-horse. No matter how often they overturned it or how roughly they played, they could not fall far enough to hurt themselves. Nearly

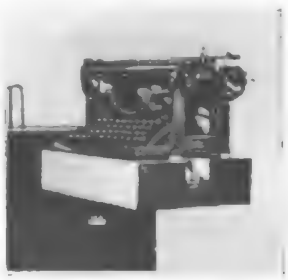


A Toy Rocker is Made Cheaply from a Light Wagon Wheel, and Provides Healthful Exercise with Great Safety

the entire felloe was used, portions slightly less than one-half being cut to form the side frames, which were held together at the ends by strips of wood about 18 in. long. Two wooden braces at each side completed the frame, and floor boards, ½ in. thick, were nailed at the bottom, while seats were formed by nailing ½-in. boards to the lower pair of side members, 12 in. below the top of the frame.—C. A. Black, Jr., Hightstown, N. J.

### Inverted Desk Drawer Holds Typewriter and Eraser

It is not unusual in flat-top desks to find a drawer, the top of which is at just the right height for a typewriter table. If this drawer is removed and inserted upside down, it will, in fact, form a very handy place to set the typewriter, as it can be reached by the operator without changing the position of his seat, and at the same time, the whole surface of the desk top is left free. In the case illustrated, the handle of the inverted drawer was made use of as a receptacle for the eraser. —S. R. Mills, Saranac Lake, N. Y.



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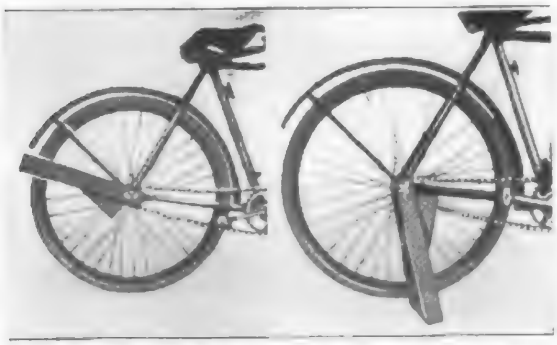
### A Simple Wooden Bicycle Stand

The homemade bicycle stand shown in the illustration was made almost without expense, and yet combines strength with

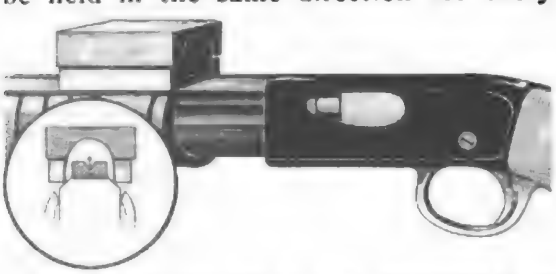


A Light Bicycle Stand, Made of Strips of Wood, is Attached to the Machine as a Permanent Fixture, without Impairing Its Appearance

extreme lightness. It consists of a three-sided wooden frame, the two uprights being about 7 in. apart at the bottom, but close together at the top, with a small hole bored through the upper extremity of each. Metal mounting steps, fastened to both sides of the bicycle frame, enter the holes in the uprights, and the length of the horizontal strip at the bottom of the stand gives it sufficient foundation to hold it steady. Blocks of wood, nailed to the uprights, strike the horizontal fork of the bicycle frame, so that the frame is kept from slipping backward. A metal clip may be riveted to the end of the rear mud guard, to hold the stand in a horizontal position when not in use.—R. Huddlestone, Victoria, B. C., Can.

### Sunshade for Rifle Sight

The glitter of sunlight on the notch in the rear sight of a rifle is sometimes a great annoyance, particularly in stationary-target shooting, when the rifle must be held in the same direction for every



A Small Cardboard Box is Used Effectively as an Aid to Clear Vision at Target Practice

shot. To avoid this, make a semicircular cut in each end of a small wood or cardboard box, turn it upside down, and set it astride the barrel just over the rear sight. The box forms a small tunnel over the sight and keeps it continually in the shade.—Willis E. Berg, Flagstaff, Arizona.

### Drinking Cups Used as Torches

While a meal was being served in a large mess hall, the electric-light circuits went out of commission, and no candles or other means of illumination were available. There were, however, a number of drinking cups made of paper treated with paraffin wax, and an experiment with one of them showed that the material could be used as a torch when twisted into cylindrical shape. It burned for about five minutes, and gave a steady light with hardly any smoke. The cups were accordingly used for illumination until the current was turned on again.—Francis W. Nunenmacher, Berkeley, Calif.

### A Fan Made of a Fountain Pen

It is hardly convenient to carry a fan at all times during warm weather, but at many an odd moment it is a distinct relief to have one. A fountain pen and a few calling cards provide the materials for a very handy makeshift. Large business cards will, of course, give the best result, and if the spring clip of the pen is a strong one, it will hold all the cards in position even when the fan is used vigorously.—Frank W. Bentley, Jr., Missouri Valley, Ia.

### Catching Mice on Fly Paper

A household which was plagued with mice found that the animals gained access to a cellar by sliding down a wire. A large piece of fly paper was therefore placed at the lower end of the wire, so that the mice dropped directly onto it; and as all four feet were caught at once, they had no way of freeing themselves. A mouse was caught in this way every day until they ceased to cause trouble.—Mrs. O. G. Romig, Denver, Pa.

¶A piece of carpet, mounted on a small wooden block, is useful for removing dirt and grit from phonograph records.

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### Perfumes Made from Flowers in the Home Garden

The readiness with which odors can be communicated to fatty substances provides us with two methods of making perfume. One of them is called "maceration," where fresh flowers are laid from day to day during a period of weeks in the same bed of slightly warmed fat. The other method is called "enfleurage," where the flowers are renewed daily in unheated fat or oil. The fat must be cut into very small pieces and boiled, after which it should be skimmed until absolutely clean, odorless, and free from water. Perfectly fresh, odorless beef-kidney suet is good for the purpose. Gather the blossoms when they are most fragrant, which is usually in the morning; discard everything but the petals, and, if the enfleurage process is to be used, put them at once into frames, made of small, shallow boxes from which the tops and bottoms have been removed. These four-sided frames must be all alike in size and shape, each with a partition, made of glass or coarse-mesh wire netting, midway between the top and bottom. Glass is needed when the perfume is to be absorbed by layers of fat, and netting, when soft cotton mats are used soaked in olive oil. If fat is used, spread a layer on the glass, ⅜ in. deep, and cover it thickly with blossoms. Place a second frame above it with its glass partition greased above and below, so as to protect the flowers underneath and to serve as a bed for others on the top. When these are in position, continue upward until the whole stock of flowers is used up, and lay a thick cloth over all, to prevent the fragrance from escaping. Leave the blossoms in the frames not less than 12 hours and not more than 24, after which separate the frames and renew the blossoms. The fat is left where it is until it has absorbed perfume up to the desired strength, which is determined by the ratio of the weight of the flowers to that of the fat. Tuberose perfume requires 3 lb. of blossoms to 1 lb. of fat; jonquil two to one; jasmine three to one; violet four to one; while rose perfume needs 10 lb. of petals, after separation from the blossoms, to 1 lb. of fat. The result of the absorption is a strongly scented "pomade," from which the fragrance is extracted by chopping it small and placing it in a fruit jar, where it should be covered with the finest odorless alcohol. It should stand in the jar for three or four weeks. During this period the perfume will be transferred to the alcohol, which can then be strained into bottles to make a stock solution; but it must be further diluted with pure alcohol for general use, as the fragrance of the concentrated extract is extremely strong.

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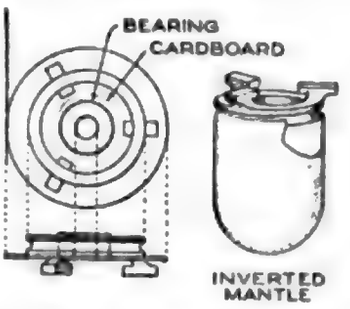
### Pulley for Toy Machinery

The metal ring used to hold an inverted gas mantle can be used to good advantage as a grooved pulley, by model builders and toy enthusiasts. Its shape and character make it an ideal pulley, and one that can be easily procured wherever gas is used. Cut out a heavy cardboard, or wooden, disk somewhat larger than the ring, and glue the two together so they fit concentrically. Then fit a shaft to the center of the disk, or drill a center hole through it, if thick enough, to receive a shaft. The grooves are deep in these rings, and they will run better than wooden or lead pulleys.—L. B. Robbins, Harwich, Mass.

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### Making Fire Pictures

A simple chemical formula provides a method of making pictures and decorative designs on paper by burning away the material in whatever direction the lines of the design are planned. Dissolve two parts of saltpeter and one part of gum arabic in two parts of water, and when the solution is fluid enough to flow from a pen, draw a design on a sheet of white paper. Be careful to make all the lines connect, and run one of them to the edge of the paper, marking the point where it ends with a small pencil cross. When the lines are dry they will be almost invisible; but if a match is applied to the penciled cross, the chemical will burn continuous tracks wherever the design has been drawn. Before igniting the train, raise the surface of the paper by bending it down at all four sides about ¼ in. from the edge. This will allow the fire greater ventilation, and will enable the ashes to fall below the paper, thereby giving clearer definition to the lines.

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¶Soda-fountain straws dipped in melted paraffin make good insulation for low-voltage wires.

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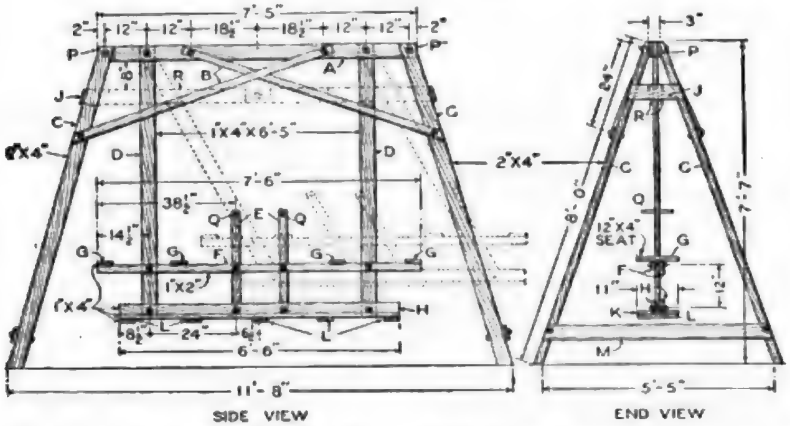
# A Hand-Car Swing

By Frank W. Roth

A FINE plaything for the children, and one that is easily and cheaply made, especially if some lumber has been left over from a building job, is a swing which is operated by hand levers, as laid out in the working drawing. It is fully strong enough for adults. Most of these will probably not see much fun in the seating arrangement, but two or four youngsters will not require much argument to be convinced of its possibilities as a fun producer.

All material required, with the exception of a few nails, is included in the list below. Substitutions can be made in many cases where lumber of different dimensions is easier found, but if the material is at hand exactly as called for, considerable time may be saved in fitting. The quickest way to make the swing is to cut the lumber fairly accurately to the lengths given. The bolt holes can then be bored before any of the parts are assembled, and all that will remain, after bolting the pieces together, is to trim off a few projecting corners. In boring these holes, much time will be saved by clamping several pieces together and running through them with a 7/16-in. auger bit, this size being used for all bolt holes. It is important, for good running of the swing, that the bit be kept at right angles to the work. Following this method, lay the six horizontal pieces H, F, and A together, so that their center points come together, and the projection of the longer pieces beyond the shorter ones is the same at both ends. Then bore holes, 30½ in. on each side of the center point, or 14 in. from the ends, of A. All these bolt holes are bored on the broad sides of the pieces, directly on the center lines, or midway between the two edges.

Before removing the clamps from the boards, bore the two holes in the two pieces A, 2 in. from each end. The boards A should then be removed from the pile, and the four pieces F and H clamped together so that the end holes register with each other; two other holes should now be put through the four pieces, 24 in. from the holes previously driven. These new holes will thus be 13 in. apart, and are used for attaching the levers E. In similar fashion, clamp together the four pieces E and D, so that all four are flush at one end. At distances of 2 in. and 14 in. from this end, bore holes, and at a distance of 2 in. from the other end bore holes, which will, of course, pass through the long pieces D only. The clamps should then be removed, and the shorter pieces E can be clamped together again, if desired, for the two holes at the top, which are 2 in. from the top end. The two pieces A should again be clamped together, and two holes bored 12 in. further toward the center than previous ones, these being then 37 in. apart. Next, the four pieces B are clamped together, and holes made 2 in. from each end, these holes being then 6 ft. 2 in. apart, center




**The Swing is Operated by the Hands of the Two Occupants Nearest the Center, and will Furnish Plenty of Exercise as Well as Pleasure**



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to center. The boards C should all be beveled off at one end to an angle of 20°, as shown, and holes made 2 in. from this end perpendicular to the beveled face—not to the length of the board. One hole is made in each piece C at a distance of 24 in. from the nearest side of the hole through the bevel, measuring, of course, center to center. Four blocks, P, used as spacers, are each bored with one hole directly through the center.

The lower edges of the boards H are nailed to K, as shown in the end view, to form members of L-shaped section. These are then set together, leaving just enough space between the pieces H for the uprights D to move freely, and the five crosspieces L are nailed on securely, nails being driven into both boards K and H. The two boards F may be assembled temporarily in position on the uprights D, leaving them loose enough to work freely, and the seats G can then be nailed in position. Two pieces of strong broomstick, or curtain pole, Q, about 9 in. long, are driven through holes of suitable size, bored in the upper ends of E, to serve as handles.

The swing is now ready for assembling. Three-eighths-inch bolts are used throughout, all being 3½ in. long, except those joining the pieces A and C, which are 5 in. in length. Jam nuts, cotter pins, or other suitable locking arrangement, must be provided for all bolts passing through the parts D, F, and H, so that the nuts will not drop off. It will be convenient to assemble first the stationary frame, then the swinging portion, and finally hanging the uprights D from the top beams A. The assembly of the swing will then be completed by nailing on the braces J and M.

One more addition may be made, however, in case it is found that there is any dangerous tendency of the swing to run over against the frame when in motion. This tendency may appear if the work is not very accurate, and, if necessary, it may be corrected by installing the guide R extending between the two braces J, and bolted together at the center with a spacer of the proper thickness between them. It will certainly be necessary to caution the youngsters against letting their arms or hands project too far to the side when the swing is in rapid motion. The same applies, of course, to lawn swings of the ordinary type, and if ordinary care is exercised, the hand-car swing should be productive of a great deal of pleasure and no accidents.

**MATERIAL REQUIRED**

A—2 pieces, 1 by 4 in. by 7 ft. 5 in.
B—4 pieces, 1 by 2 in. by 6 ft. 6 in.
C—4 pieces, 2 by 4 in. by 8 ft.
D—2 pieces, 1 by 4 in. by 6 ft. 5 in.
E—2 pieces, 1 by 2 in. by 2 ft. 8 in.
F—2 pieces, 1 by 2 in. by 7 ft. 6 in.
G—4 pieces, 1 by 4 in. by 1 ft.
H—2 pieces, 1 by 4 in. by 6 ft. 6 in.
J—2 pieces, 1 by 2 in. by 1 ft. 3 in.
K—2 pieces, 1 by 4 in. by 6 ft. 6 in.
L—5 pieces, 1 by 4 by 10½ in.
M—2 pieces, 1 by 4 in. by 4 ft. 11½ in.
P—4 pieces, 1 by 4 by 4 in.
Q—2 pieces, 1 in. round by 9 in.
R—2 pieces, 1 by 4 by 8 ft. 2 in.

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### How to Grow Dwarf Trees

Miniature trees used as parlor decorations generally belong to species which under ordinary conditions grow to a much greater height. These particular examples owe their small size to the fact that their growth has been artificially stunted. The process is simple. Cut a thick-skinned orange in two, and remove the pulp from one of the halves. Coat the skin on the outside with shellac to preserve it, and fill it with fine, rich soil. Plant two or three seeds of some evergreen tree in the soil, and set it in a room where the growing plant will get plenty of sunlight. Be careful to prop up the skin in such a way that the shoot will grow vertically; do not allow the room where it stands to become overheated, and water the soil in moderation from time to time. When the roots force their way through the peel, cut them off flush with its outer surface, and in doing so be careful not to injure the coat of shellac. After the plant has attained maturity it may be placed in a large flowerpot, and will continue to thrive there; but as its roots have been curtailed, it will be unable to draw more than a reduced amount of nourishment from the soil, and so its growth will be permanently stunted. Cedars, pines, and even some fruit trees, endure this process remarkably well.

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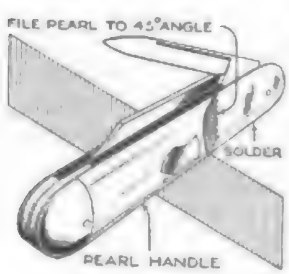
### Right Angle for Sawing Found by Reflected Light

When a board is being divided with a saw, the cutting line can be kept at an exact right angle to the board without the aid of a square, if the surface of the saw is bright enough to reflect an image. As long as the right angle is maintained, the edge of the board and its reflection will appear like one continuous straight line; but otherwise the two will seem to be inclined to each other.—Abel Green, New York, N. Y.

### Pearl-Handled Knife Repaired with Solder

Sometimes a pearl-handled knife becomes broken while one is endeavoring to use it as a screwdriver. The break usually occurs at the blade end, and many persons might throw away a good knife because of the occurrence. However, the illustration shows how to repair such a break. File the pearl back until a fairly even 45° angle is obtained. Then, by using a good soldering "acid," clean well the brass lining which has been exposed by the missing pearl, and proceed to build up the hollow spot with solder. After the solder has been allowed to cool, clean off the surplus solder with a file, or knife, so as to have its shape conform to the rest of the knife handle.

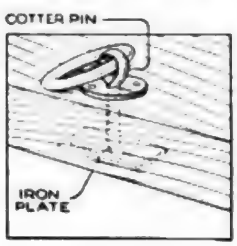



### Invisible Writing without Chemicals

Hidden records can be preserved, and secret messages transmitted, by means of invisible inks and cryptograms; but chemical formulas are required for the former, and the latter entail the labor of decoding. To dispense with both, soak a sheet of white paper in water for a minute or two, and then lay it upon a smooth, hard surface—preferably a sheet of glass. Lay another piece upon it, and write the message on the upper piece. This can be done with a match, or anything else that will cause a fairly heavy pressure where the strokes are made, a pencil being preferable, because it enables the writer to see his message. Remove the top piece of paper, and the message may be distinctly read on the lower piece. When the paper becomes dry the traces of the words will vanish, but can be made to reappear repeatedly by moistening the paper.—S. G. Stephen, Trinidad, B. W. I.

### Ring Bolt for Canoe Made of Ring and Cotter Pin

There is a good deal of risk in the common practice of using a screw eye to hold a mooring ring to the deck of a small pleasure boat. The threads tend to wear loose in the wood, and an unexpected strain may set the boat adrift at a most inopportune time. In addition, any stranger who takes a notion to unscrew it can do so in a moment. It is better, therefore, to make a more permanent fixture, and about the cheapest appliance is a brass or enameled-iron harness ring, held by a $\frac{3}{16}$-in. cotter pin, about 2 in. in length. It is advisable, also, to let the pin pass through a $\frac{3}{4}$-in. metal disk before entering the surface of the deck, and on the lower side it should be clinched tightly against an iron plate, about 1 by $\frac{1}{2}$ in. in size. The disk improves the appearance of the attachment, and protects the upper surface of the deck, while the iron plate serves the same purpose underneath.—C. C. Davis, Annapolis, Md.




### Alarm Clock Adapted for Store

An alarm clock, fitted with a mahogany face, and with hands and letters cut out of brass, was hung in a store, where it makes a very good appearance.

When polishing paste cannot be obtained for brightening nickelplated surfaces, good results can be secured with gasoline or kerosene.

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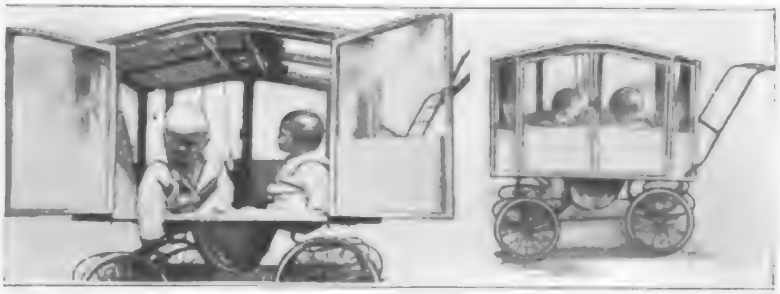
## Babies Get Fresh Air and Sunlight Undisturbed by Flies

This screened-in bedroom and perambulator was designed by the father and mother of the happy twins seen inside it. The running gear was constructed by a blacksmith; it has double-action springs, which give the cab plenty of bounce, and has the usual rubber-tired wheels. The frame is entirely inclosed by screen wire, and there are double doors, opening at the sides. These are securely fastened to prevent the babies from tumbling out.



Comfort for the Babies, Freedom from Worry for Their Mother, and Great Satisfaction for Their Father, Were the Results of This Fly-Proof, Fresh-Air House on Wheels

Through openings in the floor, the babies' feet go into the canvas bags that extend underneath the cab, when they are sitting up. Canvas flaps button over their laps to hold them steady. When a smooth floor is desired, so the babies may lie down, the foot bags are drawn up and fastened, and the flaps buttoned down to close the opening.

Overhead curtains, designed to keep out an excess of sunshine, slip back and forth on wires. Side curtains extend about halfway up the doors and sides. Canvas curtains at each end can be raised and hooked to the framework, thus providing small back rests and also serving to regulate the supply of air. In this airy cab, the babies can enjoy either an outdoor or indoor nap without a fly to disturb their slumbers.—Delphia Phillips, Long Beach, California.

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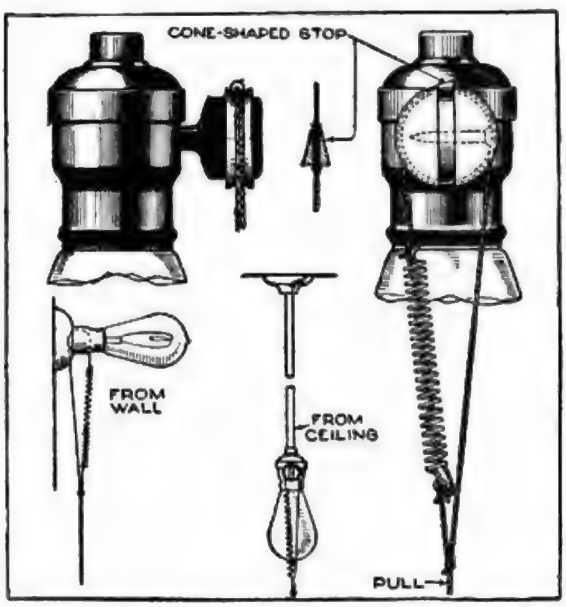
### Changing Key Sockets to Real Pull Sockets

Electric lights on the wall, or on fixtures that are firmly secured, may be operated from the floor by a very simple arrangement, as illustrated. The key of the socket is made into a wheel by the addition of two half-circular pieces, grooved on the outer surface. They are attached to the key by drilling a small hole through its center and screwing the two halves together through the hole. This may also be accomplished by making a slot in a wooden wheel, to receive the key very snugly.

A cord, or narrow tape, and a very flexible spiral spring will be needed. The cord is attached, as shown in the sketch, so as to limit the distance it can be pulled against the spring to that necessary to turn the key the proper distance. When the key turns easily, it is not necessary to secure the cord to the wheel, but if it slides, it may be supplied with a little cone-shaped brass stop, as suggested in the detail. This stop engages the edge of the half wheel in the space between the halves, these being of a slightly greater diameter than the width of the key. To operate, pull down on the cord below the point where it joins the lower end of the spring. The spring elongates, and in so doing, permits the cord to grip the wheel on the key and revolve it the desired distance. When released, the pull of the spring on the cord permits it to slack and return to its former position. When the cone is attached to the cord, it engages




An Ordinary Key Socket may be Operated by a Pull, When Fitted with This Simple Homemade Device

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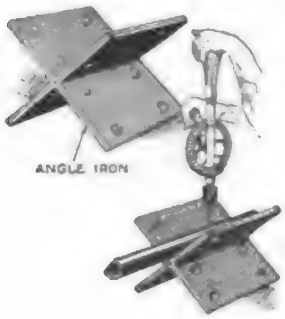
the edge of the half wheel and turns the key. When the pull is released, the stop runs back to its former position, engaging the opposite slot, and is ready to be operated again.—H. E. Gifford, Medford, Mass.

### V-Blocks Made from Angle Irons

Many bench jobs are simplified by using a V-block made of angle irons riveted together. In one position or another, the appliance will hold round, square, or flat stock; and in some operations, it can even be substituted for a vise, with the additional advantage that it is easily moved from place to place. Cut four lengths of 1½-in. angle iron, making each piece 2 in. long, and use a file to smooth the edges and the surfaces that are to be riveted together. Drill and countersink the rivet holes, and file the rivet heads smooth when the parts have been joined together.—Carl L. Rynning, Brooklyn, N. Y.




### Handlebar Clamp Permits Carrying Vacuum Bottle on a Motorcycle

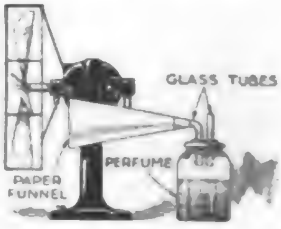
Motorcyclists who have tried various methods unsuccessfully for carrying the vacuum bottle on a motorcycle without breaking the glass container, may be interested in the clamp illustrated, which carries the bottle in such a way as to minimize vibration, and has been found quite successful. The clamps which hold the bottle to the handlebar are provided with wing nuts, which compress bands of thick felt against the sides of the bottle under the metal bands. The comparative freedom from vibration in this position seems to be largely due to the fact that it is directly above the spring forks. The owner says he has ridden some very bad roads, and has had two bad "spills" without breaking the bottle. Although removal or replacement of the bottle takes but a short time, it is not necessary to remove it in order to pour out the contents. Simply tilt the machine, remove the cap from the bottle, hold the cup in front of the opening, tilt the machine the other way, and out comes the contents of the vacuum bottle.—John E. Hogg, Los Angeles, Calif.

### Anvil for Triple-Gear Rivets

Triple gears from light automobiles are often thrown away because the rivets holding the gears together are loose. In many cases, the teeth of the gear are not worn out by the time the rivets are loose, and the gear may be made to serve for another season by tightening the rivets. This is not a difficult task if the anvil described is used. Either a bushing or a short piece of pipe is screwed into a 1¼-in. pipe coupling, and then sawed off flush with the end of the coupling. When filed off flat, this forms an anvil which fits into the triple gear, and comes against all the eight rivets that hold the gear together. The anvil is placed on a solid block, and the mechanic can then tighten the rivets by battering the ends with a punch. Unless there is such an anvil handy, the job is difficult to manage as the rivets are hard to get at. A gear tightened in this manner has been known to wear two seasons.—Fred Page, Winfield, Kan.

### Perfuming the Air in a Room

Any kind of fragrance desired can be communicated to the atmosphere in a room by means of a fan and a jar containing perfume. Thrust two short tubes through the stopper of a wide-necked bottle or jar, one of them being bent at a right angle. The jar should be about half full of perfume, and neither of the tubes should be long enough to reach its surface. Fit a paper funnel to the

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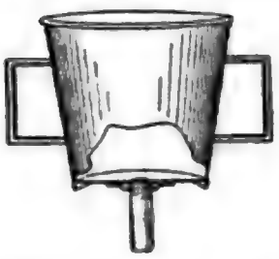
horizontal part of the bent tube, and place a fan in front of it with its back to the jar. When the fan is in motion, it will suck perfumed air from the interior of the bottle, and the vacuum thus created will be filled by fresh air admitted through the other tube. This will in turn become perfumed, and subsequently distributed by the fan through the room.—Violet Johnson, Rockford, Ill.

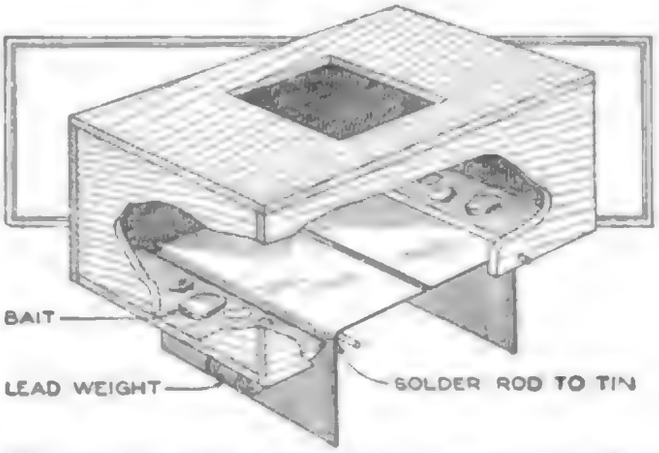
### Combined Pail and Funnel for Boats

On a motorboat locker space is valuable, and for this reason boatmen are disinclined to carry articles which are not in constant use. It is quite usual, therefore, to leave the gasoline funnel behind when on a trip, and to trust to each gasoline dealer to provide one which will not be too large for the filling hole or too short to reach through the deck to the tank. Unfortunately, these conditions are not always realized, and, to avoid trouble as well as to save locker space, a boatman devised this method of converting a pail into a funnel whenever necessary. He soldered a small iron plate to the bottom of the pail, and drilled a hole through both plate and pail, tapping it afterward to admit a short piece of pipe. This provided him with a funnel whenever he desired one, and by substituting a threaded plug for the pipe, he turned the funnel into a pail again.—Wm. F. Crowell, Providence, R. I.



### Rat Trap Requires No Resetting

The chief merit of the trap shown in the sketch is that it needs no attention after it has been placed in position, and will catch one rat after another without being reset, or baited, afresh. It is placed over a hole in the covered top of a barrel, or large box, and the rodent enters through the roof of the trap, plunges through the false bottom, and falls into the barrel. The trap is made of wood throughout, except the floor, which is formed by two tin plates. These are bent into the shape shown, and supported by wire rods which act as hinges, so that the two horizontal leaves swing downward under the weight of an entering rat, but are kept in equilibrium at other times by small pieces of lead soldered, or wired, to the vertical portions. In constructing the trap, it is important to place the bait pans sufficiently far from the hole in the roof to insure that the rats will lose their foothold on the wood, for it is necessary

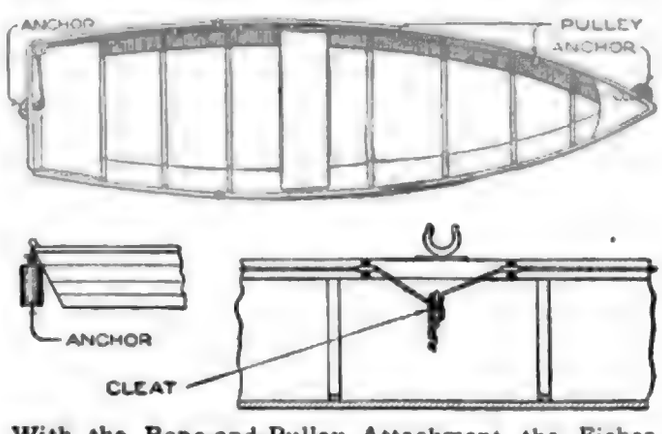



**With a Collapsible Floor a Rat Trap is Kept Permanently Set, and Renewal of the Bait is Made Unnecessary**

that their whole weight should fall on the false floor, so that they will be unable to save themselves. If the barrel contains enough water to drown the rats, the work of destroying them will entail no further trouble.—Omar M. Highley, Converse, Indiana.

### Fishing-Boat Anchors Operated from the Seat

The inconvenience of traveling from one end of a rowboat to the other in heaving or raising the anchors can be dispensed with by adopting the simple method illustrated. Holes are made in the woodwork at both bow and stern, through which the ropes reach to the anchors hanging outside. Each line runs through a series of pulleys along the inside of the gunwale, to a cleat placed near the rowing seat—a handy point is directly beneath one of the oarlocks. When casting anchor, it is only necessary to release the ropes at the cleat; when raised, they are fastened as indicated.




**With the Rope-and-Pulley Attachment, the Fisherman Has His Two Anchors at His Fingers' Ends**

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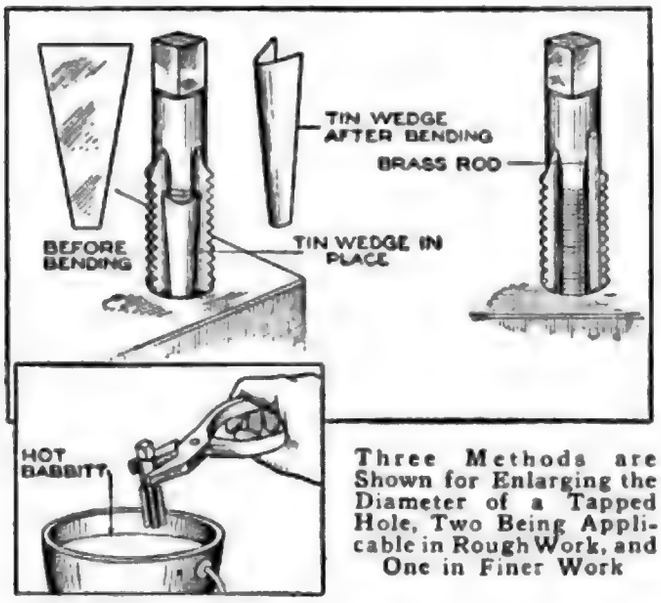
### Making a Tap Cut Large

The drawing shows three methods of making a tap cut a thread slightly larger in diameter than it would otherwise. The two in the upper picture are crude but




Three Methods are Shown for Enlarging the Diameter of a Tapped Hole, Two Being Applicable in Rough Work, and One in Finer Work

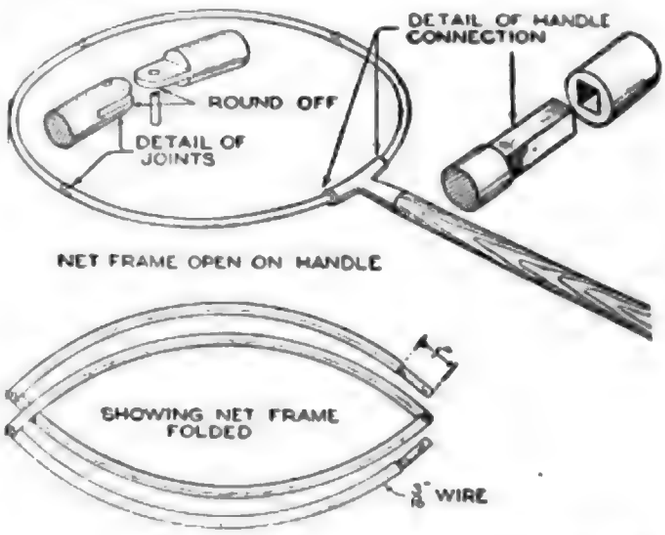
effective methods, where great accuracy of thread is not required. The tin will, of course, be bent to fit into the threads between the tap and the thread it cuts, so the enlargement will be but little more than the thickness of the tin. By using wires of different size in one flute of the tap, it is possible to vary the size of the tapped thread, within narrow limits. Where a more accurate job is required, with less enlargement, the tap can be heated by dipping it in melted babbitt metal, which will expand it. With all these methods, it is best first to run the tap through in the ordinary way, afterward enlarging the diameter by running it through again.—C. H. Willey, Concord, New Hampshire.

### Imitation Marble Finish Produced by Candle Smoke

The tedious process of making veins in an imitation marble finish can be shortened by using smoke. The surface to be finished should be thoroughly prepared with No. 1 sandpaper, after which two coats of flat white should be applied, each coat, when dry, being smoothed with No. 0 sandpaper. Then apply another coat of flat white, tinted with lampblack, and add a little varnish. When this coat is nearly dry, lay the article on its side, light a candle, and hold it near enough to the surface to allow the smoke to play over it. Draw it back and forth with quick, even movements, working from the bottom to the top so that any of the upper parts which have been darkened by the rising smoke will be treated last. After the whole area has been covered, a little color may be used in imitating different kinds of marble, and when the surface is thoroughly dry, it should be smoothed with sandpaper and varnished. —John L. Jacklin, Flushing, L. I.

### Folding Butterfly or Landing Net

A folding butterfly net that can be carried in a coat pocket makes a naturalist's field outfit less cumbersome, and such a net can be made large enough for landing fish, without being more than 10 in. long when wrapped in a bundle. Make the circular frame by cutting four pieces of 3/16-in. steel, or brass, wire, 12 in. long, and bend each of them to the shape of a quadrant of a circle, thereby making the completed circle about 15 in. in diameter. The parts are tongued and grooved at the ends, so that tongues fit into corresponding grooves at three of the joints, and at the fourth joint, the members fit snugly into a squared sleeve, brazed to a tapered ferrule, which receives the end of the shaft. When the tongues are placed in position for assembling, drill small holes for rivets, but be careful not to let the members fit too tightly after riveting. They must be tight enough to make the frame rigid when the net is being used, without making it difficult to fold it afterward. The wooden shaft must be suffi-




The Frame of the Butterfly Net Folds Up to a Package 10 Inches Long, So That It can be Readily Carried

ciently thick to make a tight fit when thrust into the tapered ferrule; and the net may be held onto the frame by spring fasteners, or even by safety pins.

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### Kerosene in Cloth Kills Flies in Garbage Can

Dead flies are a danger to the health of a household. Unless they are swept away with all other kinds of refuse, they can still spread infection, and it is therefore a good plan to use the garbage can itself as a flytrap. The insects swarm there, so that many can be killed at once, and after falling into the can they do not need further attention. Solder two pieces of wire in a horizontal position inside the lid of the can, and stretch a cloth from one to the other, saturating it with kerosene. The fumes will kill all flies which approach close enough, as long as the cloth remains damp, and after it dries it can easily be saturated again.—Albert B. Meyer, Chicago, Ill.

### Tires for Doll-Carriage Wheels

The worn-out tires of a doll carriage can be replaced with insulated wire. Cut the wire to the length of the wheels' circumference, and leave 1 in. of bare wire projecting at each end. Put both ends through a nail hole, punched in the rim of the wheel, and bend them back to secure the tire. The joint will hardly show if properly taped.—Edwin L. Camp, Huntington Park, Calif.

### The Self-Balancing Egg Trick

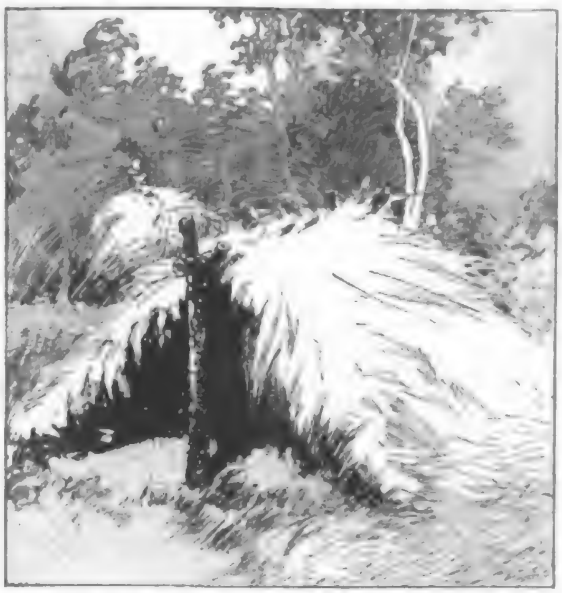
Blow the white and yolk from an egg, and fill one-third of the interior with fine sand. Stop the holes with a paste made from white of egg and powdered lime. The egg can then be balanced in any position, as the sand will always settle at the bottom. To remove any suspicion of the audience, pass another egg for examination, and substitute the prepared egg when about to perform the trick.—Hall Axtell, Amarillo, Tex.

### Writing on Photo Negatives

Any marking which is desired to be placed on a photographic negative, so that it will show on all prints, may be written on the back, or shiny, side of the film with India ink, using a clean pen. The lettering may appear in the blank border or in any clear portion of the negative; it will, of course, appear white in the prints.

### A Grass or Pine-Needle Tent for the Summer Camp

A most useful sleeping tent for campers can be made from long grass or pine needles when either of these materials are available in sufficient quantity. The poles are cut and erected for whatever size of tent is wanted, and small pieces of wood are laid, about 4 in. apart, to form the framework of the roof extending from the ridgepole to the ground. These are then covered with the grass or pine needles. The odor from the boughs is a great help toward a healthful sleep.



A Small but Pleasant and Healthful Sleeping Tent can be Made from Long Grass or Pine Needles

### Drawing Milk from Bottom of Pan

The "cream separator" shown in the illustration, while not able to make a complete separation of milk and cream, is useful when milk is wanted before the cream has been skimmed off. Punch a small hole in the bottom of the pan used to hold the milk, and plug it with a stopper cut from wood or cork. Fill the pan, and when the cream has partly risen, there will be no difficulty in drawing milk from the bottom without disturbing the cream which has risen to the top.

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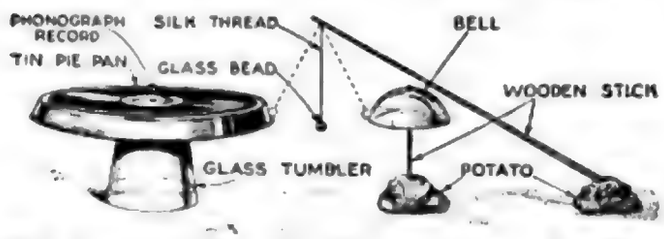
### Miniature Reading Light for Hot Evenings

When reading on a porch at night in warm weather, it is not always desirable to have the whole veranda illuminated, and a small reading lamp which can be attached to a book cover makes this unnecessary. Cut three short strips of brass about the same length, and solder them together as shown. Two of them act as a spring clip to fit onto the book cover, and the third serves as a lamp bracket. The latter is bent into such a position that the light will be thrown directly onto the page, and the width of the metal prevents it from shining in the eyes of the reader. The lamp is of low candle-power, of the type used on Christmas trees, and is fitted tightly into a hole drilled through the bracket.—William Warnecke, Jr., New York, N. Y.

### Ringing a Bell by Charges of Static Electricity

Cut an apple, or a potato, in two. Fasten, upright in one of the halves, a stick, 4 or 5 in. long. On the top of this stick attach a bell taken from an old alarm clock. Invert a glass tumbler, and place upon it a tin pie pan so that the edge of the pan will be in line with the edge of the bell. Insert slantingly, in the other half of the apple or potato, a very dry slender stick, 1 ft. or so long. At the other end of this stick, fasten a silk thread with a glass bead tied to one end of it, so that the bead comes on a line with the edges of the bell and pan. Charge a phonograph record, or piece of paper, by means of a static machine, or by stroking the record or paper with cat's fur, or with a silk cloth. Lay the record, or paper, on the top of the pie pan, and the glass bead will begin to swing quickly back and forth between the bell and pan, thereby causing the bell to ring.




**The Passing of Electric Charges between the Pan, the Bead, and the Bell, Causes the Latter to Ring**

The explanation of this is simple. The pie pan is positively charged and the uncharged bead is attracted by the pan. The moment the bead touches the pan, it becomes positively charged and is repelled. The uncharged bell attracts the positively charged bead. When the bead touches the bell it becomes discharged and falls back, and is again attracted by the pan. The frequency with which it repeats this cycle depends on the charge in the pan. A greater charge can be obtained on a dry day than on a damp one.—B. Jackson, Logansport, Ind.

### Alternating Current Detected by Telephone Receiver

Electricians at times find it necessary to distinguish alternating-current lines, or switches, from those on direct-current circuits, when both kinds of current are used on the same system, and the switches or conduits are installed close together. With a pair of high-resistance telephone receivers, the difference is easily detected. Connect them with two short cables, so as to form a complete circuit, and hold one of them against the ear and the other close to the switches, or conduits, which are to be distinguished. When the second receiver enters the field set up about a switch, or conductor, on an alternating-current circuit, the humming sound identifying it will be transmitted to the receiver held against the ear. No battery, of course, will be used with the receivers, and caution is necessary to avoid touching any live part on the circuits.—H. S. Rich, Hartford, Conn.

### Opening a Milk Can

To make pour-out and vent holes in a condensed-milk can, place the can-opener point with the back of the blade toward the center of the can; punch a hole through, and cut a slot to the outside of the circle, or circumference of the can. This permits a clean-cut stream of milk to flow, and does not give a slobbering effect as does the usual haphazard method of puncturing the can.—T. J. Hubbard, Mendota, Ill.

¶ When no soft-tone phonograph needles are at hand, use a loud-toned needle and insert halfway.

# A Water-Power Fan for the Hot Days

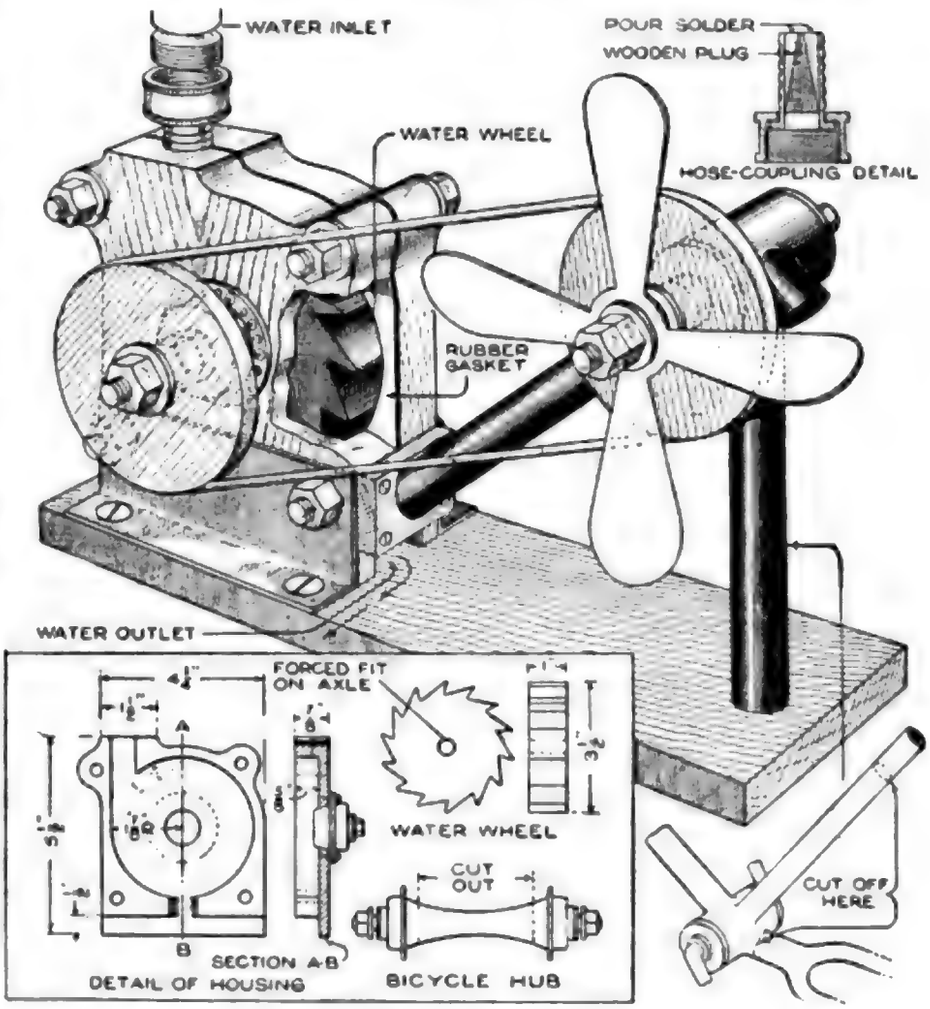
By JOHN SCHOE

A CYCLIST whose machine was ready for the junk pile used parts of it in the construction of a water-driven fan, drawing his power from a kitchen faucet. The fan revolved on the crankshaft of the bicycle, from which the cranks and sprocket had been removed, and was connected by a belt with a water wheel, inclosed in a wooden housing. An installation of this kind can be made by anyone who has a bicycle that has outlived its usefulness, and if he has access to a small lathe and band saw, his work will be much simplified.

Build the motor first, beginning with the housing. Make this in separate halves, using a lathe, if one is obtainable, to reproduce the shape shown in the illustration, and keep closely to the figures given for the interior dimensions, which allow a clearance of ⅛ in. at the sides and circumference of the water wheel. Then prepare bearings for the housing by cutting the ball races with a hacksaw from the front hub of the bicycle, and force them into holes bored in each half of the housing, taking care to make the metal a water-tight fit against the wood. Next, cut out a wooden water wheel with the band saw, and bore a hole through the center, large enough to make a force fit on the front axle of the bicycle. Thrust the axle through it, and also through the ball races, and then bolt both halves of the housing together, using pieces of rubber, cut from the inner tube of a tire, to serve as a gasket. The axle must project far enough from one side of the housing to hold a wooden pulley, secured by the locknut and washer previously used outside the fork of the bicycle. The thickness of the housing must be such as to give this projection, but not so much that the cone nuts will reach the end of their threads. The length of the axle, and of the threads upon it, should therefore be checked up, and if the housing is not thick enough when made of ⅞-in. wood, thicker stock should be used, or a wooden shim put in.

An ordinary garden-hose coupling connects the housing with a rubber hose which supplies water from a faucet. In the half of the coupling which is pressed into the housing, a nozzle is formed by inserting a cone-shaped wooden plug and pouring in solder, as shown in the detail. The plug is then driven out. A hole, ½ in. in diameter, is bored at the bottom for drainage, so that the motor may be placed in the sink over the escape pipe.

Throughout the rest of the equipment, less precision is necessary in working to dimensions. Cut a fan from a sheet of heavy tin, and bend the blades to an angle of 20° with the plane of the hub. The bicycle crank hanger will furnish a bracket and bearing, the parts of the frame which are not used being cut away with the hacksaw. Mount the hanger on a wooden base, and fit the fan and a




A Water Wheel, Operated from a Kitchen Faucet, Serves as a Motor to Drive a Homemade Fan. Parts for Making Both were Obtained from an Old Bicycle



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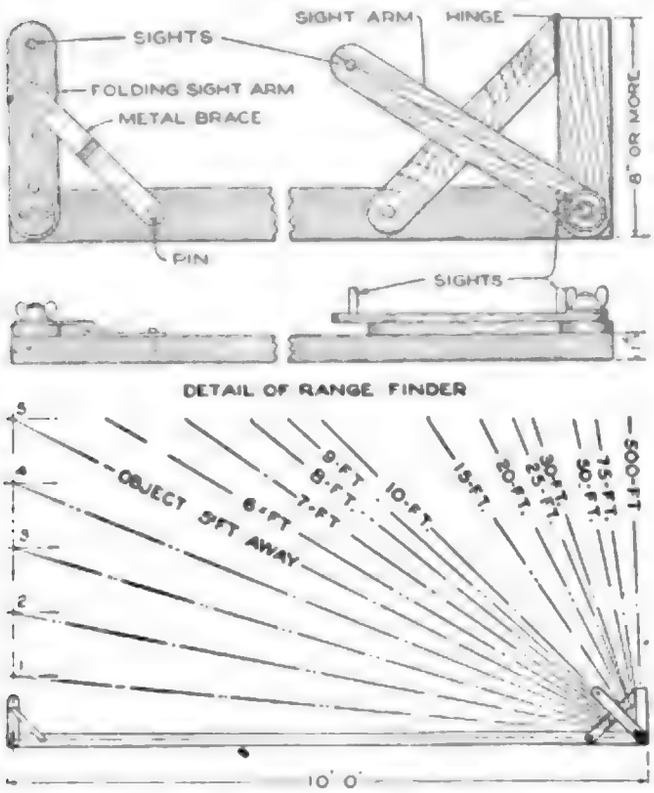
wooden pulley to the crankshaft, as shown. The wooden pulleys on the fan and on the motor present no problem if a lathe is used, while even a wood chisel will turn out a thoroughly serviceable job. Each pulley must have a groove wide enough to take an ordinary sewing-machine belt. A flat belt may be used if easier obtained, and the pulleys should then be crowned instead of grooved.

After assembling all the fan and motor parts, connect both units with the belt, and complete the installation. Two pieces of strap iron are sufficient to secure the wheel housing to the base that supports the fan, or scrap metal can be taken from other parts of the machine to serve this purpose. The whole installation will then stand firmly when the water is turned on, and the speed developed will be about the same as that obtained on most small electric fans.

## A Model Range Finder

An article that will prove of interest to boys who go camping, or take hikes, is a range finder, which enables two boys, by sighting across points at the end of it, to




**By Means of This Range Finder, Readily Constructed from a Few Sticks and Nails, Distances can be Determined without Actual Measurement**

tell the distance to any object within 100 ft. or more. The base of the range finder is a stick 10 ft. long. If one does not wish to carry an object of this length, it may be hinged on the broad side and folded up to 5 or 2½ ft. At each end of the 10-ft. stick, a shorter stick is fastened, in which are driven headless nails to form sights. Two of these are set in each short stick, one at either end, and at least 7 or 8 in. apart. At the left end the short stick holding the sights is fastened by a wing nut and bolt through one end, and a metal brace is set diagonally to hold the sight arm at right angles with the base. One end of this brace can be fastened permanently with a screw; the other end may have a pin which fits tightly, but allows the brace to be removed and the whole folded up parallel with the base for carrying. At the right end is a sight arm similarly pinned, but without the brace. Instead, two other sticks are mounted to form with the base a right-angled triangle, as shown. These sticks can be fastened permanently with screws, or, if the feature of folding up parallel to the base is desired here also, they can be attached with pins similar to the one at the other end.

The sight arm at the right end swings over the stick which forms the long side of the triangle, and marks are made on the latter to indicate the angular position of the sight arm. These marks should be determined by experiment, setting up some object at measured distances from the observers, setting the sight arms, and making a mark to indicate the position for each distance.

The method of using the range finder will be apparent from the lower diagram. Two boys hold the instrument, one at each end. The one at the left end turns the range finder to such a position that the object to be observed is in line with his two sights. The other boy then turns his sight arm until his sights are also in line with the object. The reading of the scale will then indicate the distance of the object from the observers.

It may be noted that no measurements of either angles or lengths really have to be made in building the instrument; the only lengths that have to be measured accurately are the distances to the object used for the purpose of locating the scale marks. The workmanship must, however, be careful and accurate, and if folding or hinged joints are used, there must be very little play in them, or the accuracy of the instrument will be destroyed. This is shown by the fact that in the part of the scale which will actually be used in measuring the objects at a considerable distance, the scale marks come quite close together. It will be

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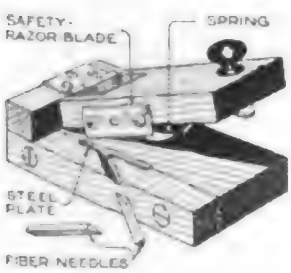
seen from this, also, that the longer the sight arms are made, the greater is the accuracy which can be obtained.—Wayne W. Leyrer, Atlantic City, N. J.

### Motor-Driven Egg Beater

A small electric motor, which had become unfit for shop work, was used by one of the mechanics in his home kitchen, where it rendered good service in beating eggs, whipping cream, and even churning butter. He screwed it to the kitchen wall, with the drive shaft in a vertical position, and as this adjustment threw all the weight of the armature onto the lower thrust bearing, he placed two mica washers between the bearing and the shoulder of the armature. The power was transmitted to the egg beater by means of a collar, pinned permanently to the lower end of the shaft, and the top of the egg beater was thrust into the collar and held firmly with a thumbscrew, so that it revolved with the shaft. The beater was made from a piece of fairly coarse iron wire, twisted into spirals at its lower end, where it entered the dish or pan containing the eggs. To prevent the weight of the thumbscrew from causing the shaft to turn unevenly, a small lump of solder was used as a counterweight on the collar, opposite the screw. Several wire beaters were made and twisted into different shapes, so as to adapt the machine to the nature of the work which was to be done.

### Cutter for Fiber Phonograph Needles

A function for old safety-razor blades is found by using them to sharpen fiber phonograph needles. The blade is attached to a small rectangular piece of wood, which is fastened to a base by a hinge, and operates like an ordinary paper cutter. When the upper leaf is pressed down, the blade enters a slot which is cut in the base before assembling, while a groove running at an angle to the slot holds the needle, the angle determining the sharpness of the point to be made. The slot is faced with iron at the side in which the groove ends, the iron fitting snugly against the blade as it descends, so as to insure a clean cut.




### Music Rack Makes a Convenient Camera Tripod

In view of the present high cost of camera tripods, camera users whose homes are provided with music racks may find it convenient to arrange the rack so that it can be used as a tripod for taking time exposures with any kind of a small camera. For a few cents, a machine shop will turn out a threaded end to screw into the tripod socket of the camera, and to attach to the end of the music-rack staff, after the upper frame has been detached. If it is not convenient to make such a fixture or have it made, the tripod-head ball joint can be bought from a photographer's supply shop for about 50 cents. The staff of the music rack will pass through the threaded hole in the bottom of this accessory, and the top of the staff may be clamped between the two halves of the ball-joint jaws, by tightening up the wing nut. The camera may then be screwed into its place on top of the ball joint, where it is rigidly supported. Good music racks are always provided with a vertical adjustment, which will be useful with the camera; it is always desirable to get the lens as nearly level with the subject as possible, and many bad pictures are the result of failure to do this. The ball-joint fixture, if used, permits tilting the camera.

### Mirror Bait for Raccoon Trap

To catch a raccoon without using edible bait, use a steel trap of medium size, with a mirror, or piece of tin foil, laid flat on the bait pan and secured in position with solder or wire. Set the trap, in water if possible, by some creek, or in some gully, where the tracks of a raccoon have been found. He is a very inquisitive animal, and when he sees light reflected from any surface, he is apt to paw it with his foot—in this case to his own destruction.—J. W. Reynolds, Mason, Ill.

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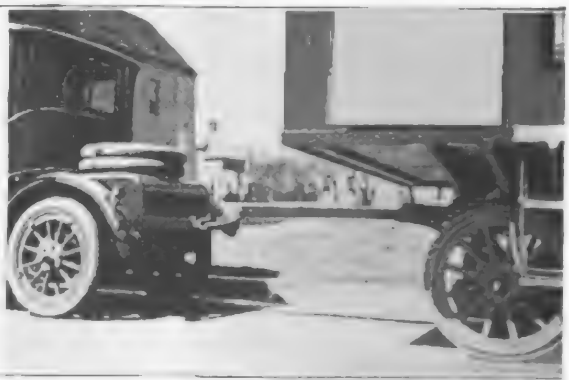
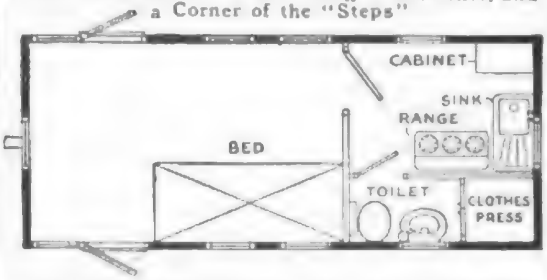
# AUTO TRAILER IS LUXURIOUS BUNGALOW



Hitched to Its Auto and Ready for the Road, the Traveling Home is Seen in the Upper Left-Hand View. At the Right We See the Front Running Gear, the Method of Attaching to the Auto, and a Corner of the "Steps"




The Plan Above Gives an Idea of the Homelike Arrangement Inside; at the Left Is a Corner of the "Parlor," in Which Part of One Bed Is Visible. The Spot between the Windows Is an Electric Light. Over at the Right Is the Lavatory, with Its Nickeled Pump for Drawing Water

TO a great many people, a camp is attractive only in theory. It suggests hardship, or at least hard work, and that is pleasing only to a certain robust minority. A fully equipped summer home that could be hitched on behind a small auto, and rolled through the landscape at the will of the vacationer, is about the only contrivance that promises to meet all tastes and overcome all objections.

It sounds like a large order; yet a Chicago designer has accomplished it. His trailer is a cottage—a bungalow, if you like—with running water and toilet facilities, and a regular cookstove and beds with mattresses. The front part, or observation compartment—call it living room if you prefer—has seven plate-glass windows that drop into the frame, and two glass doors. Besides the folding bed (which takes a box spring if the owner be a real sybarite) and the folding table, there is room for an upright piano; though some will prefer to pile trunk loads of clothing in the space.

The kitchenette at the back contains a cabinet, a range for coal or wood, and a sink, and has two windows. From it opens a little lavatory with regular bathroom fittings, a medicine closet, a clothes press, and a window. The water comes from a tank underneath, and is drawn up by a small nickeled pump. The "house" is wired for seven electric lights, supplied from the auto or a battery.

The body is built on a frame of hickory, oak, and elm, finished inside with painted wall board, and covered outside with sheet steel, enameled like an automobile. Steel running gear, artillery auto wheels on ball bearings, and solid-rubber tires put the itinerant dwelling in readiness for any reasonable road, with delightfully indeterminate stop-over privileges at all points. The whole trailer, 20 by 8 ft. and 7 ft. high, weighs about 1,700 pounds.

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# Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 SEPTEMBER, 1919 No. 3

## Magnificent Greenhouse Tops Largest Hotel

IN the very heart of America's largest city, opposite the largest railway terminal, there has just been opened the most magnificent and sumptuous of greenhouses. The ground at that point is of almost incredible value; but the new greenhouse, to make its location still more peculiar, is more than 20 stories above the ground—perched on the roof of the Pennsylvania hotel, which is, to use the superlative once more, the largest in the world. The conservatory in the sky is, as a matter of fact, a group of three huge glass-inclosed halls each a wonder in itself.

Other extraordinary qualities might be expected of such an unusual greenhouse as this, and they are not lacking. The

Great Triple Greenhouse on the Roof of the Biggest Hotel in the World: Several Hundred Feet above the Ground, the New "Sky Conservatory" Is Remarkable for a Number of Unusual Features, Including an Unsupported 55-Foot Span of Glass Roof; Walls Decorated to Give the Illusion of Distance, and Lighting Fixtures That Resemble Huge Butterflies

BY COURTESY OF THE AMERICAN GREENHOUSE MFG. CO.



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feature first to strike the eye is the great unsupported span of glass-paneled roof, 55 ft. from side to side. The next effect that startles the visitor is the apparent absence of confining walls—the illusion of distance as the vision travels on into green jungles. That is the decorator's art, of course; the walls are treated to produce just that effect. And the illuminating engineer has coöperated. Fairy butterflies with incandescent bodies reflect their light downward from translucent wings, veined and shaded in vivid semblance of life. Birds, too, but they are real, with plumage that outcolors the best work of the colorists—inhabitants of the tropics transplanted to the make-believe. Hotel life takes a considerable stride away from the conventional with this innovation. Not merely can its devotees take their ease in sybaritic enjoyment of nature's clever counterpart; they may pluck, with their own hands, the precious winter grapes, the tangerines and tropic fruits of stranger sort, and so come to realize that these gastronomic delicacies grow beautifully on trees and vines, and not on silver plates.

Thus is a new and rare flavor brought to the jaded palate of the traveler, and a concentrated breath of wilderness air held captive a few hundred feet above the unromantic pavement of the crowded city street.

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# AN EXTRAORDINARY SUBMARINE ACCIDENT

By JOHN EDWIN HOGG

AFTER a practice dive of several hours' duration, cruising submerged at a depth of 65 feet, the United States submarine ——— suddenly became unmanageable, and began to sink. Something had apparently gone wrong with the Kingston controls (operating the ballast tanks), and the crew was unable to bring the craft to the surface. All our submarines are now equipped with blowers which empty the ballast tanks automatically whenever the submarine sinks to the depth which is its safety limit. In this particular submarine the safety limit happened to be 300 feet. The boat sank to that depth when the automatic blowers suddenly functioned, and the craft shot upward like a cork. Meanwhile the operator at the submarine signaling station had heard no sounds of any surface vessels in the vicinity, so, when the craft began to rise, no attempt was made to check it. The surprise of the crew can be well imagined when, as the boat neared the surface, there was a mighty crash and the ascent suddenly stopped. Instead of bobbing out on the surface the submarine had come up under a three-masted schooner which was sailing peacefully on its way, its crew unaware that a submarine was anywhere near.

The U-boat, which was one of the latest and largest American type, struck crosswise of the schooner's keel, about one-third aft of the bow, which was reared several feet out of the water as the submarine's conning tower caught its keel. The bow of the submarine also went high out of the water. The schooner, having all sails set and running before the wind, continued to drive onto the deck of the U-boat. Thus locked together, the two boats began drifting down wind.

Several members of the schooner's crew thinking the craft had gone on the rocks leaped over board. Others took to the lifeboats. Because of the crippled condition of the submarine its commander refused to attempt submerging again. The situation was surveyed through one of the two periscopes, which was undamaged in the accident. Then the forward deck hatch was opened. Two officers climbed out, and with the aid of ropes reached the deck of the schooner. The submarine was then closed up while the officers directed the lowering of the sails. After the two vessels had been brought around in the wind the schooner's sails were used to pull it, stern first, clear of the sub.

Besides losing one of its periscopes, the submarine had a big dent in the forward deck, and the front of its conning tower was stove in. The schooner was not seriously damaged, but was leaking quite badly. Cruising on the surface, the submarine took the schooner in tow, and both vessels went into port and dry dock.

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¶Fishing is expected to become an important industry on Sardinia, an island off the coast of Italy, when a recently formed aerial transportation company begins flying airplanes between the island and Rome. Natives in the past have limited their catches to supply local needs only, due to the lack of swift shipping facilities to the mainland.

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The Picture Tells the Story of the Extraordinary Adventure That Recently Befell a United States Submarine and a Three-Masted Schooner. When the U-Boat, Disabled and Brought to the Surface by Its Automatic Air Equipment, Collided with the Keel of the Sailing Ship, Lifting the Latter's Prow Clear of the Water. By Heading the Schooner into the Wind It was Backed off the Sub, Which Then Towed It into Port for Repairs



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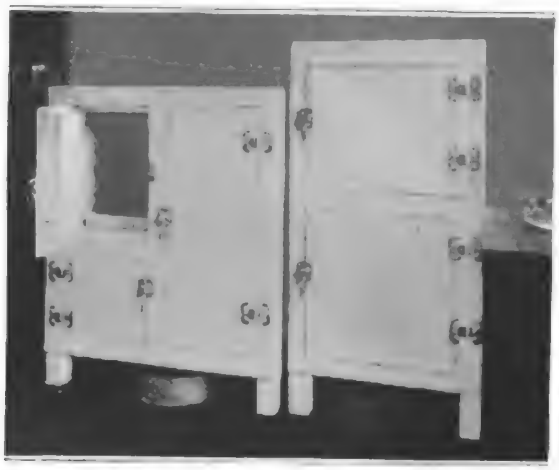
## MICROBES FIND NO CREVICES IN CONCRETE REFRIGERATOR

As it gains in popular confidence, concrete is used in more and stranger ways. Now it is the concrete refrigerator, quite



**These Indestructible Refrigerators Represent the Latest Commercial Adaptation of Concrete. They Are Free from Germs and Odor, as There Are No Joints or Crevices to Hold the Filth**

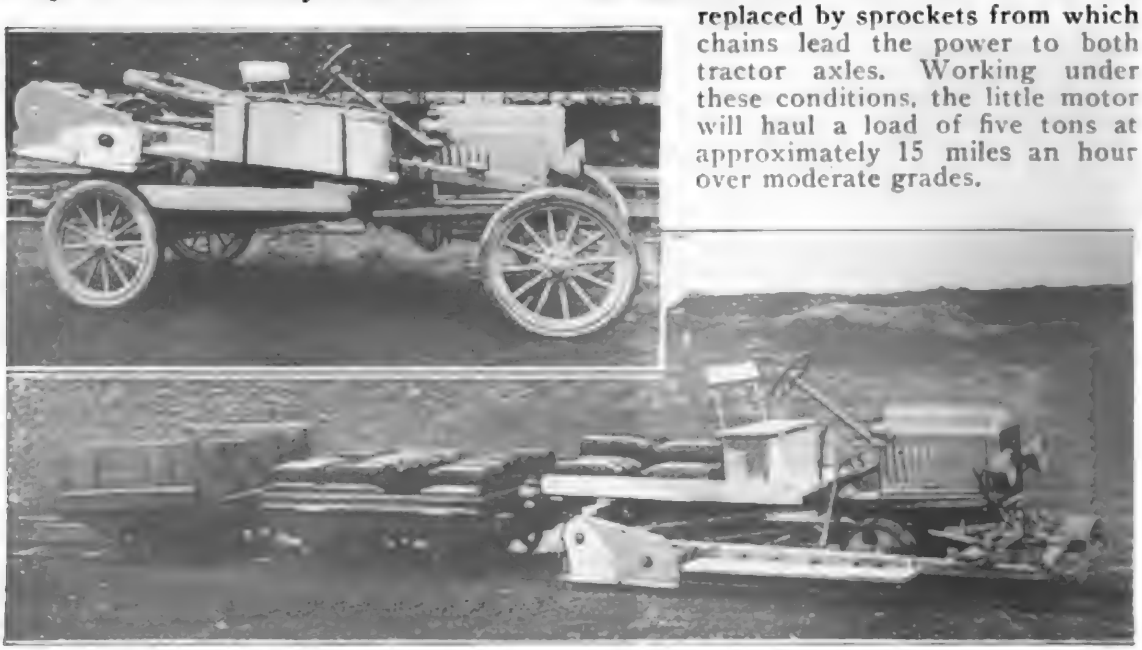
compact and far from unsightly with its gleaming metal fittings and glazed finish. Chief among its obvious merits is its indestructibility; though it is sanitary, too, as there are no joints nor crevices to conceal dirt and germs. The doors will always fit snugly as the material is comparatively unaffected by changes in the temperature or humidity of the air.

## TO EXTEND YELLOWSTONE PARK AROUND JACKSON LAKE

Yellowstone National Park is expected to grow 1,265 square miles larger as soon as the present congress reaches a bill neglected by the last session. The proposed extension, 30 miles to the south of the established boundary, takes in Jackson Lake and the wonderful mountain scenery about it, part of the famous Jackson's Hole country. Besides providing the only variety of scenic beauty now lacking in the park, the addition includes the summer grazing ground of America's last large herd of elk, and some of the finest trout-fishing water in the country. Victor, Idaho, is the nearest railway point, but there are several good auto roads.

## LIGHT AUTO CHASSIS BECOMES MILITARY RAILWAY TRACTOR

The British army authorities have developed a number of fittings for the chassis of a well-known low-priced car by which it is quickly converted into a narrow-gauge locomotive. All the parts necessary for the conversion are carried by the car itself, so that it may travel to the railhead on its own wheels and there be transformed into a railway tractor. The operation takes about one hour. Front and rear wheels are removed and the chassis mounted on the tractor frame of channel steel. The rear wheels are replaced by sprockets from which chains lead the power to both tractor axles. Working under these conditions, the little motor will haul a load of five tons at approximately 15 miles an hour over moderate grades.



**The Little Passenger Car is Shown Above as It Travels to the Railhead under Its Own Power, Carrying All the Fittings Necessary for Its Transformation into a Railway Tractor. The Change is Made, as Shown Below, by Removing the Wheels, and Bolting the Chassis to an Auxiliary Frame of Channel Steel**

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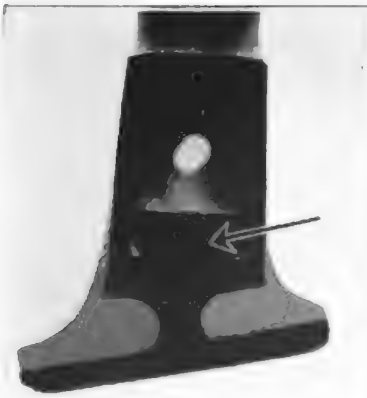
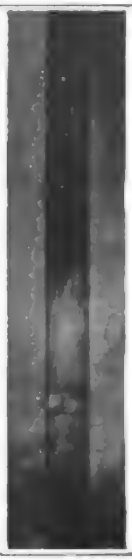


Radiograph of Airplane Skid, Revealing Packing between the End and the Bottom of the Socket, the Skid having been Cut Too Short



At the Left, the Radiograph of a Three-Ply Airplane Spar Shows Knots and a Grub Hole in the Center Lamination. Above Is a Carburetor Radiographed in Operation, Revealing Some Hidden Defects

The X-Ray Photograph Made Clear the Faulty Riveting and Defective Soldering along the Seam of a Steel Gasoline Tank

## X-RAY FINDS HIDDEN FAULTS IN WOOD AND METAL

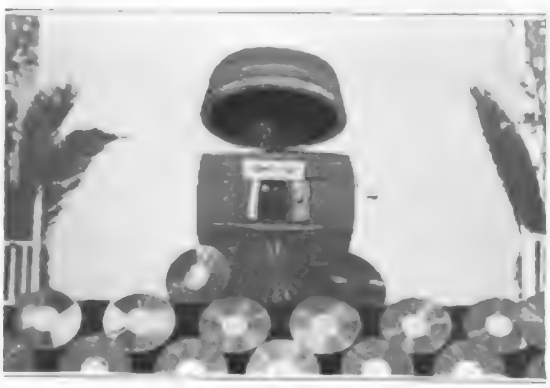
Though the X-ray has been working its way to a position of indispensability in the surgical field for some 24 years, its great value to industry is just beginning to be appreciated. An outstanding example of its usefulness as an inspector of superhuman powers was afforded recently in England, during an examination of new air craft. Radiographs in this case revealed serious defects of material and workmanship that no amount of visual study would have found. In a wooden spar of three laminations, the middle, and hidden, section was shown to contain two knots and a grub hole. When the hollow box strut was X-rayed, the strengthening block in the end was plainly seen to be not only badly fitted, but actually split by its fastening screws. It was also made obvious that a wood skid had been cut too short for its socket, and the resulting empty space had been filled with packing. Even the faulty riveting along the seam of a steel gasoline tank "came to light" in the photograph, as well as a defect in a working carburetor. Factory practices of this sort will probably be terminated by consciousness of the new inspector's power.

## COMPRESSED AIR HAMMERS TAMP CONCRETE SHIP

Pneumatic hammers were employed to tamp the concrete used in constructing the steamship "Polias," said to be the second largest vessel of its type afloat. After the mixture had been poured into the hull form, the hammers were applied to the boards, and the vibration caused by their blows thoroughly packed the concrete. Two wooden shells, one placed within the other, were used to mold it into the form of a ship. In the 5-in. space between the shells was placed an intricate network of steel for reinforcement of the concrete. It was found impossible to tamp it in the ordinary manner, because of the danger of shifting the reinforcing material.

## WINDOW DISPLAY FEATURES BEER-KEG PHONOGRAPH

Tears spring to many an eye as the beer-keg phonograph in the window of a large music house plays "How Dry I Am," "Drink to Me Only with Thine Eyes," and other classics. In spite of its past, the honest old keg makes music just as sweet as do its polished neighbors in the show window.



**The Place of Honor in the Window Display of a Music House was Given a Beer Keg Which, with a Few Alterations, Became a Practical Phonograph**

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COPYRIGHT, KEYSTONE VIEW CO.

his Unusual Photograph of the "R-34" as Snapped Just One Minute After Major ritchard Leaped from the Forward Gon- ola to Superintend Landing Arrangements at Roosevelt Field, Long Island

# BRITISH DIRIGIBLE MAKES PIONEER ROUND TRIP OVER ATLANTIC OCEAN

By PAUL A. JENKINS

BRITAIN'S transatlantic dirigible, the "R-34," poked its huge bulk out of the clouds northeast of Pulham, England, in the early morning of July 13. Circling the aerodrome three times it glided smoothly to the ground. A rope curled down from the forward gondola to the landing crew on the field. In a moment hundreds of eager hands grasped ropes and railings, and, straining at the great structure, slowly "walked" it into its shed without accident.

Conducted with workmanlike precision, this operation marked the finish of the first aerial round trip over the Atlantic Ocean. In just the same easy way the "R-34" rose from East Fortune, Scotland, on July 2; with the same unhurried exactness the long craft was navigated through darkness and fog, around thunderstorms, and even down Broadway. The keynote of the whole successful performance was sounded by Major Scott on descending from his ship at Pulham Aerodrome. He remarked that "the voyage home has been without incident." No better proof of success could be desired. Brig. Gen. Maitland, who made the round trip as representative of the British Air Ministry, seems justified in saying that the commercial practicality of long-distance air voyages was amply demonstrated. Confirming this is the remark made by Col. Wm. N. Hensley, Jr., representative of the U. S. Army Air Service, who was privileged to make the return journey: "While the sea below was tossed by a 40-mile gale, we were cruising along in comfort on an even keel. Regular airship service between Europe and America is bound to come, and soon."

And in reckoning the value of the "R-34's" performance, one must bear in mind that larger dirigibles are being built. Airmen of the future will class the "R-33" and the "R-34" with the caravels of Columbus. Yet the "R-34" is tremendously large and a source of amazement to those permitted to inspect it. The cigar-shaped frame is 665 ft. long and 79 ft. in maximum diameter. From this rigid frame are suspended four gondolas, one forward, two amidships, and one at the stern. In the forward gondola, which corresponds to the bridge of an ocean liner, ride commander, navigator, and radio operator; from it run speaking tubes, electric communication wires, and steering controls. Each gondola carries a 275-hp. engine driving a large pusher propeller, except that the rear gondola carries two motors, revolving one propeller.

A tour of inspection about the cavernlike interior of the big envelope is the ambition of everyone who sees it. A deck or "cat's walk," 15 in. wide and 600 ft. long, runs from bow to stern along the bottom of the framework. Above it are



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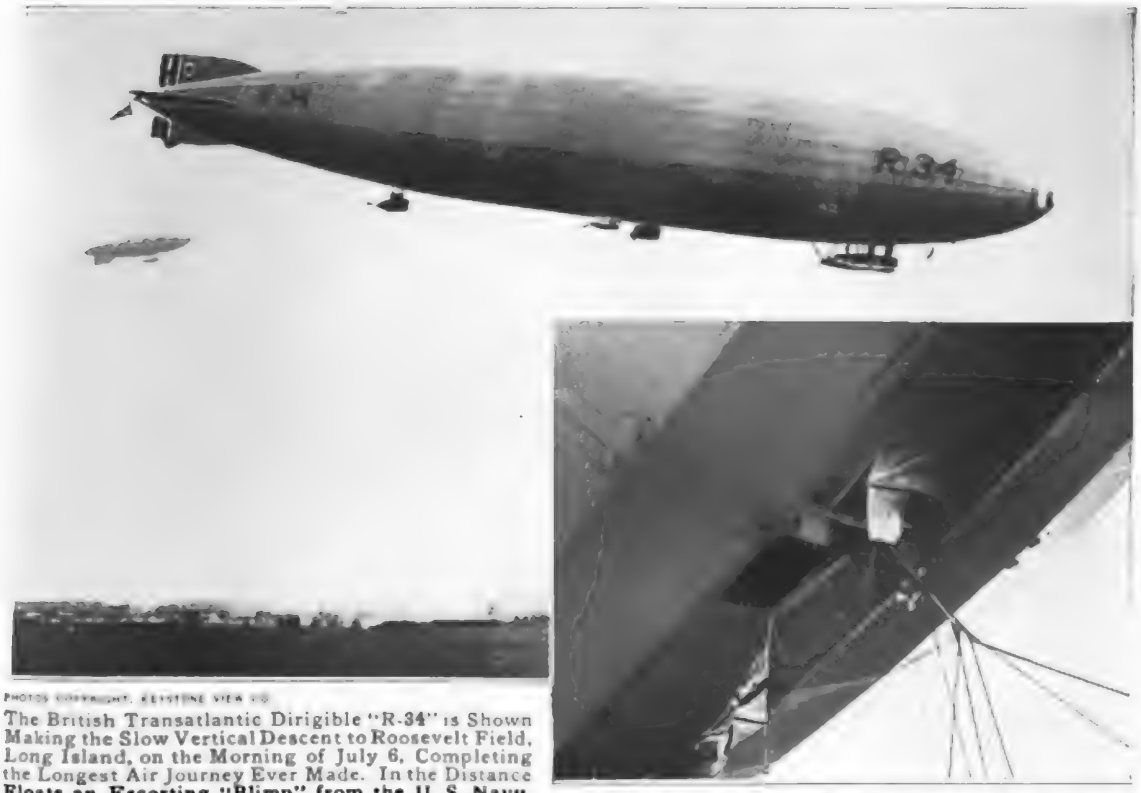




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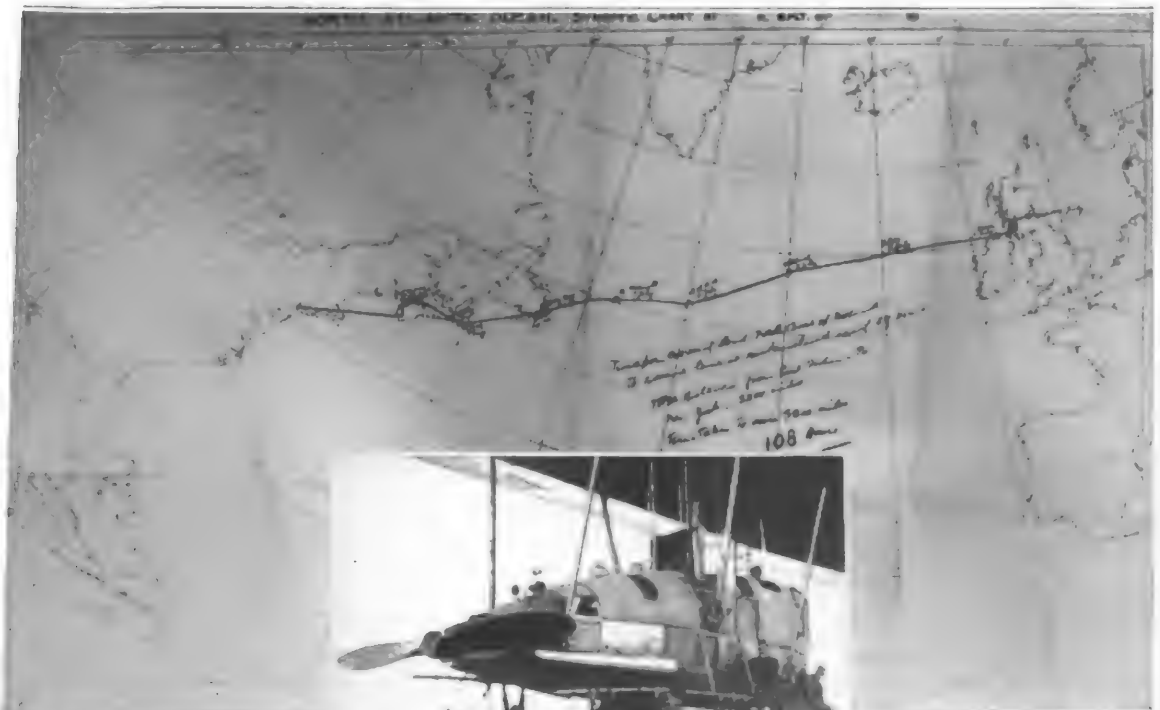
The British Transatlantic Dirigible "R-34" is Shown Making the Slow Vertical Descent to Roosevelt Field, Long Island, on the Morning of July 6, Completing the Longest Air Journey Ever Made. In the Distance Floats an Escorting "Blimp" from the U. S. Navy. On the Field Were 600 Soldiers Ready to Catch the Mooring Lines and Weave Them through the Rings of the Huge Concrete Anchors. At the Right is Shown the Rent Torn Next Day by a Breaking Cross Girder to Which One of These Lines was Attached



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On This Chart the Navigator of the "R-34" Marked the Successive Positions of the Great Air Liner. His Office was Fitted with Chart Racks, Tables, and Every Desirable Navigating Instrument

At the Left Are a Few of the Thousand American Soldiers Who were Drilled As a Landing Crew for the Reception of the "R-34." In the Absence of a Hangar the Vast Framework Was in Constant Danger of a Smash-Up

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the 18 ballonettes which hold a total of 2,000,000 cu. ft. of hydrogen gas, each bag in its own compartment. Ranged along the sides are gasoline and water tanks, sleeping hammocks for the crew, and canvas containers holding life belts and parachutes. The "dining salon" is in the center, where the ship is widest, the space measuring about 8 ft. by 20 ft., with tables hinged to the framework. Unfortunately the men have to stand while they eat. Ladders throughout the hull give access to small cockpits in bow, stern, and to the top of the bag. It is interesting to read in General Maitland's diary that the navigating officer was often on top of the bag making his observations in the bright sunlight, while those in the gondolas below were surrounded by gloomy fog.

Because comparatively free from difficulties and disaster, the flight of the "R-34" may be summed up in a few sentences. The craft rose slowly from the hands of the landing party at East Fortune, near Edinburgh, Scotland, on Wednesday, July 2, at 1:42 a. m., the coolness of that hour giving the ship its greatest possible lifting capacity. Low-hanging clouds and darkness envelope it at 100 ft. In the tanks are 4,900 gal. of gasoline; the crew consists of 11 officers and 19 men, not including the stowaway later to be found in the envelope. Fog makes the sea invisible at the start and during almost every subsequent hour of the voyage. By 3 p. m. the wireless operator reports that he is in communication with both sides of the Atlantic. During this and succeeding nights the crew is kept busy with the regular routine, four hours on and four hours off, their working time being spent in navigating, steering, elevating, and nursing the engines. Meals are uniformly pleasant affairs, with hot drinks to be had and phonograph music if desired. At 2 p. m. Thursday, the engineer officer demonstrates a new method of engine repair. He sets the entire crew to chewing gum, with which he closes a crack in a cylinder water jacket. On Friday morning the dreary coast of Newfoundland is sighted, just 59 hours after leaving the coast of Ireland. Saturday, at noon, when 500 miles from New York, the gasoline situation becomes serious. During the afternoon, the precious fluid is consumed even more quickly, as the ship is maneuvered around several severe thunderstorms. On Sunday morning, Major Scott is fearful that gasoline will not hold to Mineola. The engineer officer "comes through" again, however, by scraping the last drop out of more than 60 "empty" tanks, using cups and cooking utensils in the search. This "bonanza," with a favoring wind, brings them to Long Island. On Sunday, July 6, at 9:54 a. m., a perfect landing is made at Roosevelt Field, L. I., the air voyage having consumed 108 hours and 12 minutes, and being remarkable as the longest in the world's history.

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**This Cheerful Youth is Distinguished as the First Aerial Stowaway to Cross the Atlantic. He Returned a Prisoner on a British Warship**

Allowing for the absence of a hangar, the technical arrangements for the landing of the "R-34" were admirable. In anticipation of all possible demands, our navy stored on the field 8,000 tanks of hydrogen gas, 7,000 gal. of gasoline, and 500 gal. of oil. The great bag, so unwieldy on earth, was anchored and guarded without a mishap. During the three days of its stay the dirigible was seen by tens of thousands, and thoroughly inspected by air-service officers of the U. S. Army and Navy. Being advised of advancing cyclonic disturbances on July 9, Major Scott steered his craft from American soil at 11:59 that evening. He courteously circled backward on his course, passing south along Manhattan to let the New York crowd share in the excitement of his departure. The return journey was completed without incident in the remarkably good time of 75 hours and three minutes. With the assistance of favoring winds Major Scott was able to make the first 800 miles over the Atlantic in just eight hours.

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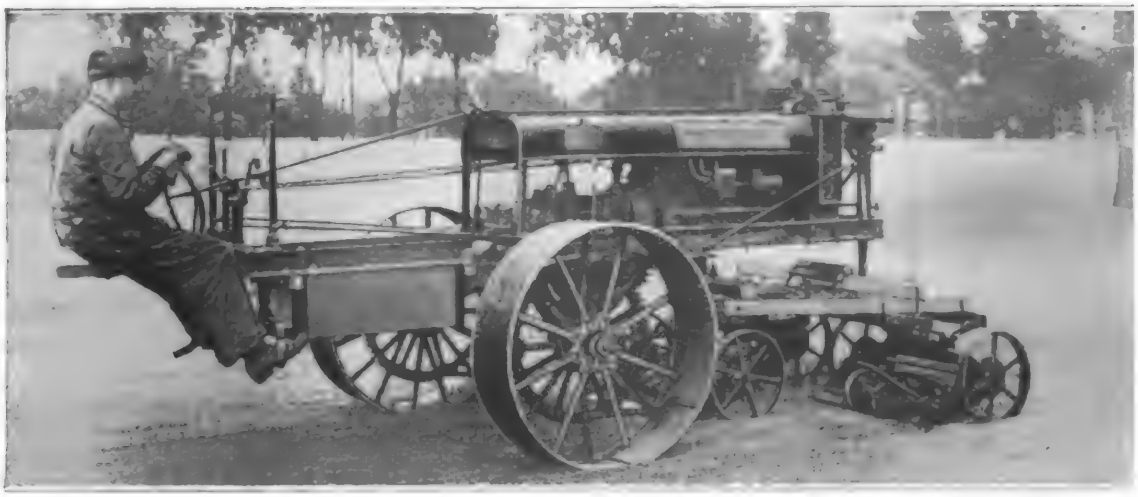


Motor Cultivator and Corn Planter with Its Front Wheel Replaced by a Gang of Three Lawn Mowers on a Wood Frame, Which Cut a Good Deal of Grass and Serve Also to Steer the Machine. It is Used to Mow the Lawns of an Illinois Golf Club

## MOTOR CULTIVATOR BECOMES GOLF-LINKS GRASS MOWER

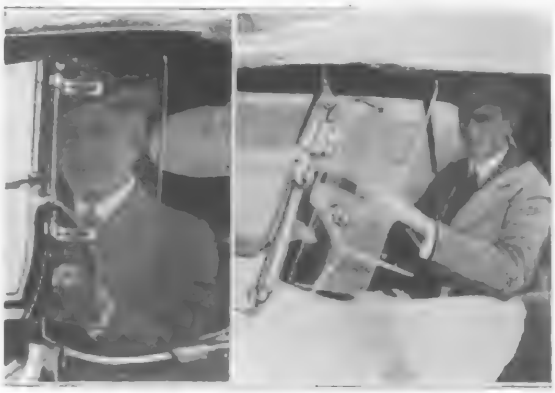
That so highly specialized a piece of agricultural machinery as a motor cultivator and corn planter can do other jobs with equal success is being demonstrated in an Illinois town, where one is now used to mow the grass on the golf links. The front wheel of the cultivator was removed, and in its stead was mounted a gang of three 28-in. lawn mowers of the conventional form, fastened to a timber frame. The broad, flat steel tires of the machine roll over the lawn without injuring it, guided by the mowers themselves, which are turned by the regulation steering wheel.

## AIRPLANE ECLIPSE EXPEDITION HOUNDED BY MISFORTUNE

A steamship cleared from New York two weeks before the recent solar eclipse, bearing Prof. David Todd of the Amherst College Astronomical Observatory, a naval seaplane, and a crew to fly it. The professor hoped to sail to a point about 1,300 miles northeast of Pernambuco, Brazil, rising at the time of the eclipse to an altitude high above the clouds. From this position, during the six minutes and fifty seconds of the eclipse, he intended to make observations and take numerous photographs. Consistent misfortune pursued him, however. The steamship broke down soon after leaving America, and was forced to limp into Bermuda for repairs. The party was marooned in Bermuda on the day of the eclipse. They set out for Pernambuco, however; only to encounter a more serious breakdown, attended by actual suffering from lack of food and water. Reaching port, the seaplane was removed from the ship, to be torn from its moorings and wrecked during one of the worst storms in several years. Thus ended the first expedition of its kind.

## AUXILIARY WINDSHIELDS SOLD AS AUTOMOBILE ACCESSORIES

Auxiliary windshields, or deflectors, have lately taken their place as useful and desirable automobile accessories. They are simply small pieces of plate glass easily fixed to the frame of the larger windshield where they are effective



These Auxiliary Windshields are Fast Coming into Favor as Useful Automobile Accessories. Both Types are Quickly Adjusted to Best Guard the Riders

in guarding the rear seats from wind and dust. Thumbscrews permit quick adjustment of both the deflectors illustrated.

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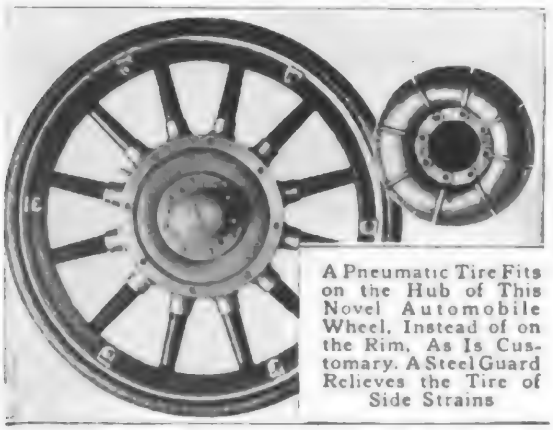
## HUB-TIRED WHEEL FOR AUTO DESIGNED BY INVENTOR

Instead of placing pneumatic tires on the rims of automobile wheels, a Baltimore inventor advocates putting them



A Pneumatic Tire Fits on the Hub of This Novel Automobile Wheel, Instead of on the Rim, As Is Customary. A Steel Guard Relieves the Tire of Side Strains

on the hub. He has constructed a wheel which allows this to be done and declares it to have proved satisfactory. In this the hub is somewhat enlarged and carries a small inflated tire. Surrounding the tire is a grooved steel ring, from which the spokes radiate. Bolted to the hub is a plate, shaped to receive the side of the tire, and covering the tire and the edge of the ring. This is designed to relieve the tire of side strains. The rim of the wheel is fitted with a solid composition tire. A record of 43,000 miles of travel has been made by one such wheel.

## ACROBATIC CYCLIST THRILLS CALIFORNIA BEACH CROWD

Thrilling the public of this age is a task requiring not only daring, but originality and skill as well, so accustomed have people become to witnessing hazardous feats. Among the reckless performers who have succeeded in eliciting gasps from modern crowds is an acrobatic motorcyclist who recently roused spectators on a California beach with an unusual act. Balancing his machine and its attached sidecar on the two wheels of the former, he stood on the frame of his cycle and drove at a speed of 25 miles an hour over the sand, controlling the motor with his left foot and right hand. A passenger standing in the sidecar made the feat more difficult and spectacular.

Something New to Thrill the Public: This Daring Motorcyclist Furnished Entertainment for a California Beach Crowd

## HIGH-WHEELED QUARRY CART CONVEYS HEAVY LOADS

Because of its high wheels and low center of gravity, a slip-jack cart, used in a western stone quarry for hauling rocks to a crusher, can be drawn over uneven ground by a single horse, even if loaded to its capacity of two tons. Suspended between the wheels of the conveyance, the skip may be lowered to the ground for loading, and raised a few inches by a crank-operated windlass when it is desired to move the cart. At the rear is a long lever which is used to dump rock from the skip through a trapdoor into the crusher. When the cart is standing still, the horse is relieved of the weight of the load by a shaft support.

A Single Horse can Draw a Load of Two Tons in This High-Wheeled Slip-Jack Cart, Which is Used in a Western Stone Quarry

## STRANDED STEAMER FLOATED BY EMPTY BARRELS

Empty barrels placed in the punctured hold of a steamer stranded recently on the rocks in Bristol Channel increased the buoyancy of the vessel to such an extent that it was floated without difficulty. The salvaging was accomplished on the high spring tide, after repeated attempts to rescue the ship by other means had failed.

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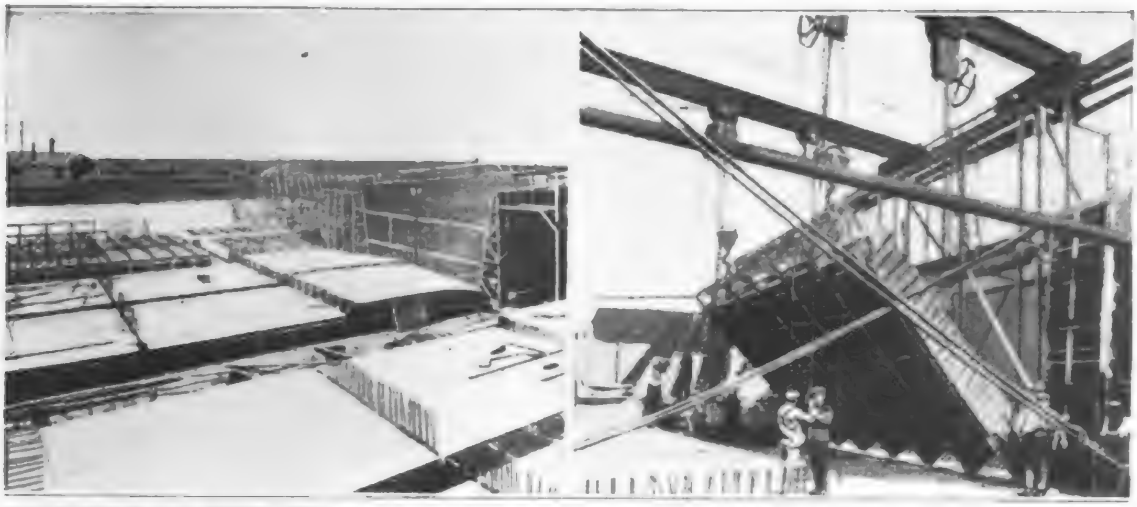

PHOTOS BY COURTESY OF THE ENGINEER, LONDON

The Ship's Sides are Made by Casting the Concrete Flat, as Seen in the Left Picture. The Method of Hoisting These Flat Sides into Place on the Ship, After They have Set, is Clearly Indicated in the View at the Right, Which Also Shows the Size of the Sections

## CONCRETE-SHIP SIDES BUILT IN FLAT PRECAST UNITS

By reverting, in effect, to the primitive conception of a ship as a floating box, British engineers have been able to make some decided improvements in concrete-ship construction, as applied to a fleet of five colliers just completed. The novel feature of the system used lies in casting the ship's sides in horizontal units, 3½ in. thick, which, after the concrete has set, are raised to their final position, the joints occurring only at bulkhead lines. Bow and stern, being curved, are cast in place in the ordinary manner, with a thickness of 5 in. The flat bottom is molded after the sides are completed, and it is interesting to note that women are employed to construct the reinforcing network. The colliers are 185 ft. long, 35 ft. beam, and 18 ft. deep, with perfectly square lines except at bow and stern.

## PHYSICIAN PROPOSES PLAN FOR JUDGING HOSPITALS

Hospitals will be classified according to their merits for the information of the public, if a standardization plan proposed recently by a medical authority is put into operation. It is said that institutions of this kind vary considerably as to facilities, and that while the service of some is good, others surpass in diagnosis and treatment. Classification would result in general improvement by creating a standard.

The Floor, or Bottom, of the Ship is Formed After the Sides have been Hoisted into Place, the Interior Then Appearing as at the Left. The Right Picture Is of the Completed Fleet of Five Concrete Colliers as They Looked Just after Launching

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## HEAVY CAR BACKS INTO RIVER FROM FERRYBOAT DECK

Just as a ferryboat crossing the Delaware River from Camden, N. J., docked at its Philadelphia wharf, a short time ago, a big seven-passenger auto, the last one on board, suddenly backed off the deck into 18 ft. of water. Only five of the eight persons occupying the car were rescued. After divers had fastened tackle to its front axle, the sunken auto was hoisted out with a derrick. Immediate examination showed that the gears were in reverse, and the switch on, a condition which was not explained.

Hoisting Out of the Delaware River the Seven-Passenger Car That Backed Off a Philadelphia Ferryboat into 18 Feet of Water

## AMERICAN HOUSING METHODS FOR REBUILDING FRANCE

France, in its task of restoration of devastated territory, is confronted by much the same housing problem now that was successfully solved by industries in this country during the war. The manner in which the situation was met at Hog Island and similar projects, where individual dwellings for great numbers of families were required on short order, is being studied by a visiting commission of French architects and engineers. These modern methods of group construction are equally applicable to reconstruction.

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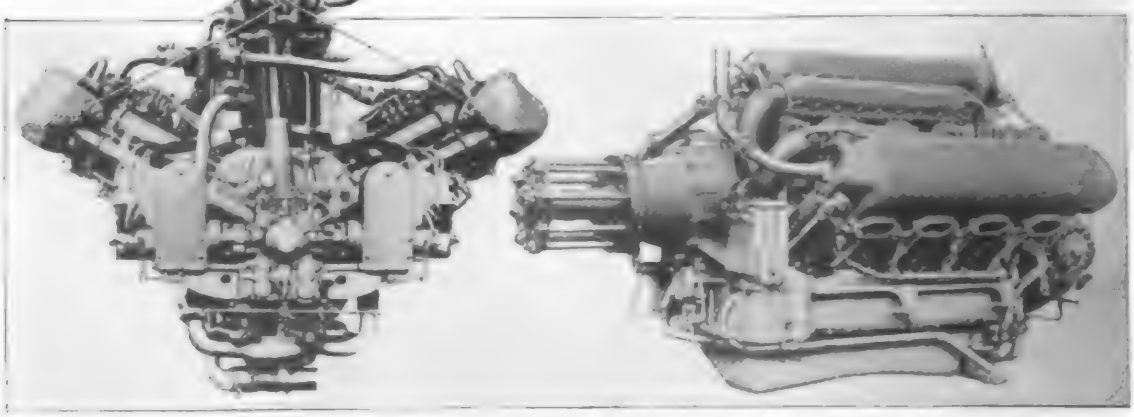
## LIGHTWEIGHT NAPIER TWELVE SHOWS NOVELTIES IN DESIGN

The 12-cylinder, 450-hp. Napier aero engine is one of the most successful examples of the "broad arrow" method of cylinder arrangement, involving three sets of four each. Every cylinder has two inlet and two exhaust valves, operated by overhead cam shafts. The connecting rods of only the four vertical cylinders act directly on the crankshaft, the auxiliary rods in right and left-hand cylinders being hinged to the central rods. The fireproof disposition of the carburetors is noteworthy also. As there are three separate air intakes, one cylinder block may back-fire without disturbing the other two, which will continue to run, thus sucking in the flames. The engine is something of a novelty, too, in having a separate water jacket for each cylinder instead of a multiple jacket for each block of four cylinders. The weight per horsepower is only 1.89 pounds, including a reduction gear.



Many of Britain's Most Successful Airplanes have been Motored with This Compact Power Plant, Known as the "Napier 12." The Weight, Including Reduction Gear, Is Only 1.89 Pounds per Horsepower. The Cylinders are Arranged in Three Sets of Four Each

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Only the Stability Contributed by a Cargo of Several Hundred Pounds of Halibut Keeps the Dory Right Side Up as the Unconcerned Fishermen Bring It to the Lee Side of the Schooner in a Smother of Heavy Seas, into Which a Single Error in Handling the Small Boat would Precipitate Them Bodily

# THE LURE OF THE NORTH PACIFIC

By LAWRENCE WILLIAM PEDROSE

THE cod fisher of the Newfoundland banks, the trawler of Grimsby, have been immortalized in song and prose, but little has been told of the "halibutter," the fearless fisherman of the north Pacific who often fares up into the shadow of the Arctic to harvest old banks or to search for new ones.

The life of the halibut fisherman is one of chance and of hardiness. No voyage is too long, no passage too dangerous for him to navigate, in what may seem to landlubbers like a little toy ship built for the sheltered waters of some bay or inlet and equipped with still smaller toy dories. Mountainous waves may race before the wind and angry reefs may rear their heads above the surface, but the tiny auxiliary schooners of the halibutters mind not the danger, because they are masters of it usually. The halibutters are a sturdy lot—the captains of the boats usually members of the old seafaring school; each of the crew typical of the real navigator, able, fearless. The lure which draws the prospector, the "pot at the end of the rainbow," holds the halibutter to the sea. The daily thrills, the fascination of the game with death he plays, are calls which he cannot resist. Like the lumberjack, who is always going to quit the woods when he makes a stake, the sailor who is always going to quit the sea next voyage, and the prospector who is always going to quit the hills when he makes a strike, the halibutter always swears off when he has made a successful trip—and invariably goes back.

The Schooner, under Both Canvas and Engines, Drives Homeward at Racing Speed, and the Danger-Loving Sailors Take Advantage of the Opportunity to Do a Little Surf Riding in the Flat-Bottom Dories, Which Skim the Seas Like Hydroplanes



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Work does Not End with Daylight by Any Means, For the Day's Catch is Still to be Dressed Down, a Task in Which All Hands Join Except the Captain. When the Seas are Running High, It Is Something of a Trick to Clean a Slippery 75-Pound Fish and Get It Below with Speed and Celerity

The cruise of the halibut boat may extend from three weeks to as many months, depending on the distance to the banks, which are selected according to season. The boats are worked by shares —one-third to the boat, two-thirds to the crew of from six to eighteen men, including the cook. The owner of the craft usually is its master. It is not an uncommon thing for a boat to return from a cruise with 90,000 to 125,000 lb. of fresh halibut stored away on ice in its holds. This brings a market price of from 12 to 18 cents a pound at the docks, netting the owner of the lucky boat about $6,000, and the crew approximately $1,000 apiece for three months' work.

One Man Gaffs and Kills the Fish While the Other Tends the Line, Which Runs over a Pulley

## INVESTIGATION OF FARMING ENCOURAGED BY BRITAIN

Agricultural research work in England will be encouraged by the use of an appropriation of $10,000,000 recently made by the British government. Farming problems are now being investigated by not more than 40 men in England and Wales. It is hoped to increase this number to 150 during the next few years. Scholarships, and other inducements, will be offered to those showing aptitude for the work, and measures will be taken to bring to the notice of farmers the value of scientific methods.

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## PANAMA CANAL AIR DEFENSES BEING PLANNED BY ARMY

Air defenses for the Panama Canal will be planned after the report of a military board, now investigating on the isthmus, has been received. Instructions given to the board indicate that the War Department intends to place several defensive aerial units in the Canal Zone, besides four balloon companies to assist the coast artillery in adjusting fire. The number of aerial units necessary and the best sites for their stations will be decided by the board, which also will consider other questions relating to the protection of the canal.

## RAILROAD STOPS OIL WASTE WITH PITS BENEATH TRACKS

More or less oil is slopped over each time the tanks of an oil-burning locomotive are filled. The loss is small in the case of a single locomotive, but becomes considerable when repeated thousands of times each month. So, one railroad has built pits beneath the tracks at all refilling stations. The overflow falls into the pit, from which it is drawn at intervals for reuse. The saving of oil from the pit in the illustration is said to amount to 25 bbl. a month. With oil at $1.50 a barrel, and hundreds of these pits in use, the total saving is a big one.

**This Pit Collects the Crude Oil Which is Slopped Over in Filling the Tanks of an Oil-Burning Locomotive. It Conserves Much Oil That was Formerly Wasted**

## BALING MACHINE SALVAGES BARBED WIRE

How the vast system of barbed wire that has been pounded into Europe's battle fields and doubly entangled by tank and shell, might ultimately be removed, has been the subject of much speculation. The British war office estimates that at least 100,000 tons of wire are rusting in its lines alone. The salvage committee, however, is cleaning it up at considerable speed with the help of a special baling machine. A 12½-hp. engine, on a motor truck, operates the machine on a trailer. A heavy wire rope, armed with numerous hooks

**The Baling Machine on the Trailer, Driven by an Engine in the Truck, Draws In the Tangled Barbed Wire with Hooked Cables, and Compresses It into Compact Cubes Like Those Seen at the Rear of the Platform**

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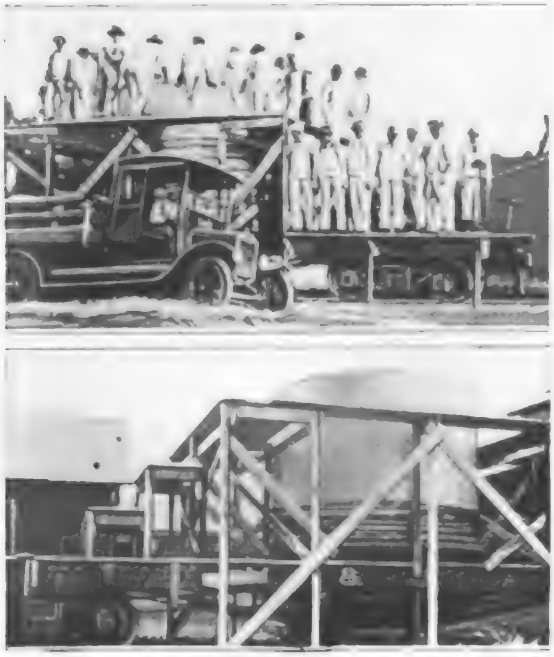
drags the barbed wire through two sets of rollers, which reduce the mass first to 48 by 48 by 12 in., and then to 48 by 12 by 12 in. A powerful ram then crushes the bundle into a compact cube of 12 in., weighing 70 or 80 lb. The first machine used in the field made 32 cubes in an hour.

## WISCONSIN FACTORIES MAKE WORLD'S LARGEST CHEESE

Facts and figures relating to an enormous cheese recently made in a Wisconsin city support the claim of its manufacturers that it is the largest of its kind in the world. Weighing 31,964 lb., the cheese is 8 ft. high and 10 ft. in diameter. It is valued at $16,000. Twelve thousand cows, grazed on 1,800 dairy farms, furnished the 357,000 lb. of milk used in its making. To coagulate this milk, 1,215 oz. of rennet were used. Eight hundred pounds of salt were placed in the cheese as seasoning. Two cloths, each 33 ft. long and 16 ft. wide, were used to swath the product. Seventy-three cheesemakers, working in 59 different factories, had a hand in its manufacture. The galvanized-iron container in which the cheese was made weighs 8,000 lb. It was placed on a flat car before the curd was poured into it, and will be shipped with its contents to Chicago, where the cheese will be exhibited at a dairy show.



Making the World's Largest Cheese: Above, Cheesemakers Pouring Curd into the Huge Vat; Below, a View of the Container Mounted on a Flat Car

## AERIAL OBSERVERS ADJUST FIRE OF BIG COAST GUNS

American aerial observers have developed remarkable precision in the adjustment of fire from the field guns and heavy artillery. It is only recently, however, that army observers have conducted "shoots" for the big coast-defense guns. Absence of reference points, difficulty in orientation, and other obstacles have embarrassed the airmen while spotting shots many miles out at sea. Experiments on these new problems of coöperation between airplane and shore battery have nevertheless been under way for several months along the eastern coast. A successful "shoot" was staged at Fort Hancock, N. J., a few weeks ago. Twelve-inch projectiles were hurled at a target 15 miles from shore. The directing airplane cruised at 4,000 ft. and was able to guide the fire with such accuracy that a "bracket" was obtained in less than 13 shots, a target being "bracketed" when one shot falls over and one short. A battleship in the position of the target would have been destroyed.

## HUGE HELMETS ARE ROOFS FOR DUGOUT PORCHES

Strictly military in design are the porch roofs made by French soldiers during the dull days of the armistice period and placed at the entrances of their dugouts along the Soissons-Reims road. Shaped like trench helmets, the roofs are several feet across and complete in all details, even to the insigne on the front of the crown. They are supported in front of the dugout doors by posts.

Huge Helmets Serve as Porch Roofs in Front of Dugouts along the Soissons-Reims Road. They were Made by French Soldiers

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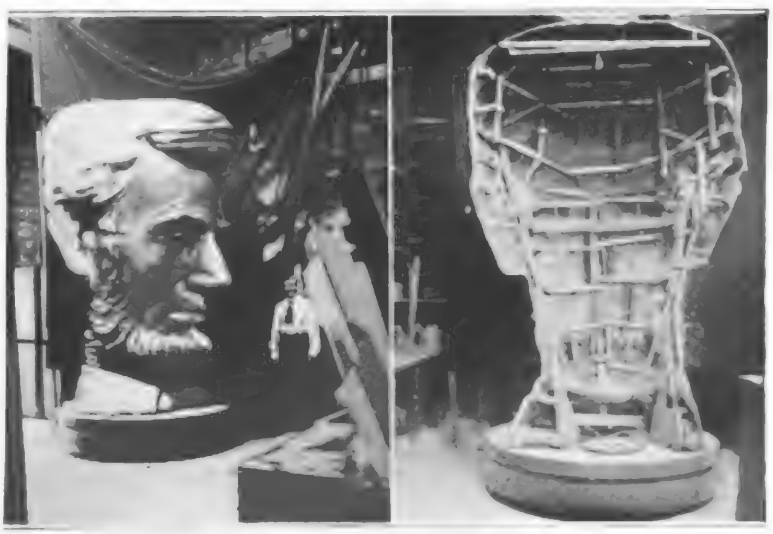
**NAVY'S TRANSATLANTIC SEAPLANE DISPLAYED IN CITY PARK**

THE seaplane "NC-4," veteran of the world's first transatlantic air journey, is home again. The ship was dismantled at Plymouth, England, and returned to the United States in the hold of a navy vessel. Arriving at New York City, it was transported to Central Park, and there reassembled on orders of the Secretary of the Navy. Interested crowds gathered during the reconstruction and the week of its stay, drawn by a feeling for the romance which will cling forever to the ship and its story.

## SCULPTURED HEAD OF LINCOLN STANDS ELEVEN FEET HIGH

Though the head of Abraham Lincoln has been modeled and sculptured in all imaginable sizes and expressions, the recently completed work of an artist in Tacoma, Wash., easily takes first place for sheer bigness, if nothing else. The finished head, of bronzed plaster, will be 11 ft. high. It is hollow, and braced within by a timber frame; but the clay model from which the plaster was cast was solid, and weighed 40,000 lb. While the artist worked on the upper portions, an assistant threw the clay up to him in handfuls, which were pounded into place with mallet and fist. The hair of the forelock was modeled with a shovel, and the lips so molded that one side of the face appears sad and the other joyous. The head, though as yet without a back, is being exhibited in various west-coast cities.



**Modeled by an Artist of Tacoma, Washington, This Enormous Sculptured Head of Abraham Lincoln is Believed to Be the Largest Likeness of Its Kind of the Great Emancipator. On the Right Is a View of the Work from the Rear, Showing the Framework**

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# PROVIDED IN CONDENSED FORM BY TURNTABLE

Here Is the Compact Little Kitchen That is Brought into the Room by Revolving the Platform on Which It Stands. Its Convenient Arrangement can be Seen by a Glance at the Illustration. Cooking Fumes are Carried Away by a Ventilating Duct Connected with the Hood over the Stove

This Picture Shows the Dressing Table Nearly in the Proper Position for Use, with the Bed Disappearing from View as the Carrier Turns. At the Left, beyond the Bed, is Seen the Hall of the Apartment, and the Entrance to the Clothes Closet is Coming into View on the Right

In This Position the Versatile Turntable Exposes Both the Kitchen and the Combination Writing Desk and Bookcase. Turning the Device in One Direction Brings into Position the Means for Cooking a Meal, and Turning It in the Other Makes Books and Writing Material Accessible

One of the Numerous Doors of the Writing Desk is Hinged So That It will Drop Down and Provide a Proper Surface for Writing. When the Occupants of the Four-in-One Apartment Desire to Convert It into a Library, They Turn the Revolving Column into the Position Shown Here

BY COURTESY OF PASQUALE L. CIMINI



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## MOTOR BUS RECEIVES RADIO MESSAGES AS IT TRAVELS

Ocean-going steamships are not the only conveyances privileged to maintain radio communication with the rest of the world as they move along their courses. A motor bus running from London to Colchester, England, was provided recently with a wireless receiving antenna, consisting of a coil of wire on a rectangular wood frame, mounted on the side of the body. Passengers of local prominence were supplied with head telephone receivers connected to the wire, and as the bus bowled along the highway they listened to speeches and music whose clearness was unimpaired by their aerial flight. The transmitting station was a temporary field installation of the military type.

**The Rectangular Wooden Frame on the Side of the Bus Carries the Wire Coil That Serves as Antenna to Collect Radio Messages as the Car Moves along. The Passengers are Seen Listening to Speeches and Music**

## AIRPLANES SURVEY FORESTS TO VALUE WOOD PULP

Four airplanes are being used to survey the extensive forests of Labrador to determine the value of the wood pulp represented by the growing trees. Aerial photographs will be taken of many parts of the peninsula for use in compiling statistics. The surveying party, which left the United States recently for Nova Scotia, is composed of 40 persons and is headed by a man who served two years as a captain in the British air forces.

## SHELLS CLEAR BIG TIMBER FROM RUSSIAN FARM LANDS

From Russia comes another story of American ingenuity solving native perplexities. In Petrograd were stored great numbers of large-caliber shells, intended for German foes, but quite superfluous in the playful skirmishings of revolutionist and counter-revolutionist. In the woodland domains, once the property of the crown but now appropriated for peasant farms, stood huge trees, too large and too numerous for removal by ordinary means. An American newspaper correspondent entered at this point with the suggestion that the shells be brought to the trees. His suggestion was followed. With a little knowledge of American methods he showed the peasants how to bury the shell at the base of the tree, how to connect wires to a distant switch, and how to explode the charge which uprooted the tree. The system is now reported to be in general use, clearing large areas for peaceful cultivation.

## COMFORTABLE MOBILE HOUSE BUILT ON TRUCK CHASSIS

Few of the conveniences of a stationary dwelling are missing from the comfortable house built on a truck chassis by a nomadic eastern man, who, with his family, is touring the country in his motorized living quarters minus the usual hardships. The special body is 18 ft. long, 7½ ft. wide, and 7 ft. high, and has a porch, 7½ ft. square, hinged on at the rear. When the porch is let down and supported on a level by attached legs, the mobile home has a length of nearly 26 ft. A roof over the porch gives protection from sun and rain, while awnings can be lowered on the three sides of the veranda to make of it a canvas-walled room. Inserted in the awnings are windows of mosquito netting, which admit air, but exclude insects. Inside the body are sleeping accommodations for seven persons, and a complete kitchen, includ-

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A Comfortable, Roomy Home on Wheels, Built by an Eastern Man Who Likes to Tour, but Dislikes the Usual Hardships: Inside Are Sleeping Accommodations for Seven Persons, a Complete Kitchen, and Other Conveniences.

ing a refrigerator, an oil stove, and a fireless cooker. There also is a wash room and toilet. On the roof is carried a canoe, for use when a stop is made near some body of water, and a phonograph provides indoor entertainment.

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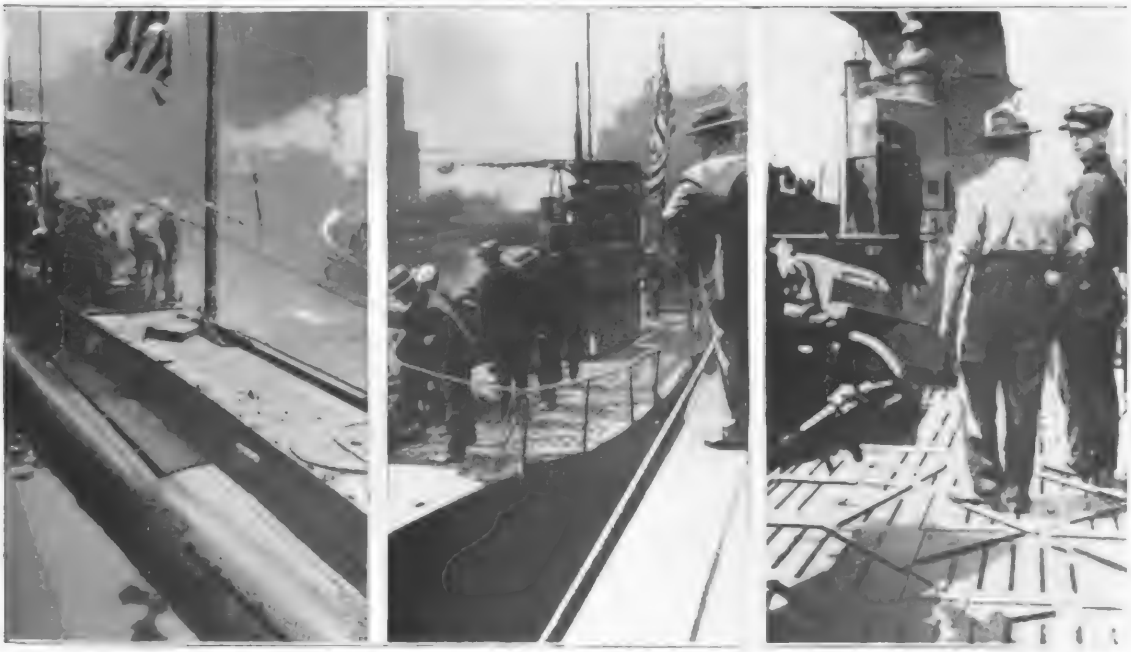
¶Two courses in spoken Chinese are included in the summer curriculum of Columbia University.

## U-BOAT VISITS LAKE CITIES IN RECRUITING CAMPAIGN

Germany's U-boats failed to win the war, so a number of them are now winning men for the U. S. Navy. A typical recruiting visit was paid to Buffalo, N. Y., by the "UC-97" not long ago. Crowds thronged to the harbor, curious to see the humbled monster. A few at a time,



A Submarine, Formerly of the German Navy, Lately Journeyed on a Recruiting Mission to Buffalo, New York. Curious Visitors are being Shown the Bow and Stern Hatchways in the Two Left-Hand Photographs. At the Right is Seen the Bridge, Still Adorned with the Imperial German Crest in Yellow and Black

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they were allowed to descend the gangplank to inspect the deck and conning tower. On top of the bow is seen the huge saw teeth intended to cut through the nets before allied harbors. Deck gun and mast may be withdrawn in 50 seconds. The insigne of the once-imperial German government is still displayed on the conning tower. Official "credit" is given the "UC-97" for sinking seven allied vessels, which are thought to be represented by a harp, a pair of scales, and other strange symbols on the sides.

## SMALL THREE-WHEELED AUTO DESIGNED FOR CHILDREN

A tiny automobile of the most unusual simplicity has been designed and built for use by the youngsters. The original vehicle, car is a three-wheeled wheel steered by the front in rear. and driven by the two Full elliptical springs

**In This Little Three-Wheeled Motor Car the Automobile has been Reduced to Its Lowest Terms. A Single-Cylinder, Two-Cycle Engine is Mounted on the Axle**

on the driving wheels and a coil spring in front absorb shocks, and are intended to serve also instead of pneumatic tires. Power is furnished by an electric motor and storage cell, or, if preferred, by a gasoline engine. The single-cylinder, two-cycle engine used in the original car is of special design, driving the rear wheels directly from the crankshaft. The inventor hopes to dispense with differential gears and other bothersome features in this way and plans to market his machines at $100 or less.

## POSTMARK ADVERTISING USED FOR NATION'S FORESTS

Advertising national forests as vacation resorts is being done by the Forestry Service Bureau through the use of postmarks. Post offices in southern California, near the Cleveland National Forest, are assisting in the campaign by using two such marks, one suggesting the reservations as places for spending vacations, and the other making an appeal for assistance in preventing forest fires. It is planned to use similar marks in all post offices located near national forests.

## COMPETITION WILL ESTABLISH COST OF COMMERCIAL FLYING

A great airplane "economy run," the first of its kind, will shortly be held in France to answer questions of vital interest to the profession. At the end of a long journey the contesting machines will be examined and graded for security, comfort, speed, lifting power, and cost of transport per ton-mile. Thus the much-debated financial possibilities of commercial aviation will be clarified, and air-craft producers and the business world will learn more exactly what it costs to fly. The competition is open to all allied machines carrying four or more passengers. Among the contestants will be distributed a first prize of $20,000, and six others varying from $15,000 to $1,000. The course runs south from Paris to northern Spain, to northern Italy, thence back through France, Switzerland, and Belgium to London, and to Paris again.

## VOLTAGE REGULATOR ALLOWS UNIVERSAL USE OF FAN

Equipped with a compact transformer that handles currents varying in force from six to 110 volts, a small electric fan, carried by a salesman who travels in the state of California by motorcycle, is used by him wherever he goes. The transformer is contained in the back of the felt-lined case in which the fan is packed. Manipulating a multi-pointed switch on the transformer regulates the voltage of current supplied to the fan motor. Attached to the storage battery of the motorcycle, the fan is used to cool the engine while repairs are being made to the machine. It runs equally well on the 35-volt current used for lighting sleeping cars and the 110-volt circuit in hotels.

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# ON THE TRAIL of the "HARD STUFF"

By E. T. BRONSDON

ACCORDING to some of the less scrupulous "wet" propagandists, and even in accord with the arguments of a few of the most ardent advocates of the Death Valley brand of prohibition, the little brown jug now is going to have no place wherein to lay its cork. A new breed of dogs is to be trained; these are to be known as $C_2H_5OH$ hounds. One of them will be able to smell a drop of whisky through four inches of bessemer plate lined with asbestos, and track it unerringly to its lair.

Each country district and each municipality will own one of these sharp-nosed creatures. The second hard liquor is brought in or distilled near at hand, the dog will go "a-rarin'" after it. Search and seizure will follow, of course.

Officers who will have charge of the enforcement of the new amendment doubtless wish some breeder would invent this animal immediately. Though no move is to be made under the present law against stores of liquor resting innocently in the basements of their respective owners, illicit distilling or illicit sale now is a serious offense and must be detected and punished, else "blind pigs" will make a joke of the constitution of the United States.

*"Covered completely by dough and crust, the bottle never would have been detected had not his driver crossed the wires on one delivery and left whisky loaves at the homes of unsuspecting customers who really wanted bread."*

Federal officers have a task before them in this. The Yankee is an inventive chap, even when he turns to lawbreaking. Though it is to be deplored, it remains a fact that as long as there exists a widespread demand for intoxicating beverages in this country, men are going to attempt to satisfy that demand. Some distilling will go on. A great deal of transportation and sale of liquor, already distilled against the drought, will be attempted despite the prison term and heavy fine which await the offender who is caught.

Officers who have this branch of endeavor to watch recently have been examining the possible means that will be used for the transportation of liquor stores. In obtaining these data they have gone to the files in what previously has been dry territory—states that put their feet on the neck of the Demon Rum in the days when a majority of the assemblage of states still was problematical. The means and methods employed by booze runners in the past are as interesting as the schemes for getting negro slaves to the "underground railway" in the days before the Civil War, and are extremely pertinent in the present.

Loaves of bread that are shipped from wet into dry territory always are suspicious; probably now every loaf that is baked and distributed for sale will have to pass the inspection of a $C_2H_5OH$ hound.

The reason for this lies in the enter-



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prise of a southern baker, who recently was found to be shipping liquor into prohibition territory. His bakery was near the state line, and many of his deliveries were made in the adjoining Sahara. For no apparent reason his export trade began to boom. After a few weeks he was selling five times as many loaves of bread across the line as he sold in his own county!

One day the secret came out. Into many of the loaves he delivered across the line he baked a good-sized flask of "mountain dew." Covered completely by dough and crust, the bottle never would have been detected had not his driver crossed the wires on one delivery and left whisky loaves at the homes of unsuspecting customers who really wanted bread.

Automobiles carrying a large number of spare tires will probably fall under suspicion shortly. It has been found to be such an easy solution of the problem, when going on a fishing trip or when replenishing the depleted stores of a "blind pig," simply to place tin inner tubes in three or four tire casings, fill the receptacles with high-proof, and buzz merrily along to the destination. Out in Oklahoma all the Fords carried a complete change of tires for a time, without the finger of suspicion pointing. When a few, dissatisfied with the capacity of a flivver tire, started strapping on 37 by 6-in. truck tires for spares, the game was off.

Another auto method that enjoyed some popularity was that of carrying either two gas tanks, or placing a false tank in the center of the true gasoline tank. The latter was not as satisfactory as the first, because both gasoline and liquor were strictly limited in quantity; the car could not make a long trip on little gasoline, nor could it be illegitimately profitable on a small volume of whisky.

The first plan had much in its favor. Until lately many cars were made with the gas tank under the seat. Now almost all, except a few of the smallest, carry it in the rear. A second tank under the driver's seat can be fitted up with ease, however, and it is extremely hard to detect. Even if one sees the liquor tank it is hard to remember that cars aren't made that way any more. Nine out of ten persons would pass it by without a thought of booze-running; in that it has much of a lead over the spare-tire plan.

A certain Canadian distillery, with headquarters on the Detroit River, found means for delivering liquor in dry territory in a volume impossible to persons employing the more ordinary smuggling devices. Because of its location, directly across the river from the dry state of Michigan, because of the small volume of business transacted, and because of the apparent prosperity of the place, officers watched for a long time. Even then detection did not come until a lucky accident happened.

While dragging the river for the body of a drowned man, the authorities pulled up a length of pipe from the bed. This pipe led directly from the distillery to a dry-goods warehouse on the Detroit side. Needless to state, practically the whole of the liquor product of the distillery was sent to Michigan in the pipe as quickly as it was made.

Furniture bound for the state of Maine

*"Out in Oklahoma all the Fords carried a complete change of tires for a time. . . . When a few, dissatisfied with the capacity of a flivver tire, started strapping on 37 by 6-in. truck tires for spares, the game was off."*

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used to incur the gravest suspicion in the days when all the neighboring states were rivals in the trade of keeping her inhabitants supplied in spite of the law. Hollow wooden pedestals, loaded with booze, were mixed with shipments of solid mahogany, oak, and walnut, and were enjoyed to the limit by the consignee. In shipping furniture, the various parts of large pieces ordinarily are shipped separate; to keep the weights of the rum-laden legs and pedestals from seeming out of the ordinary, two hollow pedestals were crated together, thus approximating the total weight of two solid pedestals. Often the same containers were used over and over again, the consignee returning the emptied furniture as a "mistake in style."

This method, as well as the thousands of similar stunts possible with other articles of like nature, probably will be one of the most popular now.

On the two Thanksgiving days and Christmases spent by our boys in camp in this country, many civilian relatives attempted to relieve the monotony for them by sending in fire water disguised in various ways. One of the cleverest of these was exposed at Camp Devens, where real roast turkeys came in with camouflaged stuffing of whisky demijohns. Many other means of smuggling liquors were tried, such as shipping boots with the lower part loaded, hiding flasks in boxes of candy, and so on; but because of the vigilance of the delivery department, a great many of these were unmasked. On the whole, our boys who served in the army were better taken care of than they could have been in civil life, so far as opportunities for drinking are concerned.

The manner in which smuggling of liquor across national boundaries may be accomplished in some cases is suggested by an experience of a county in the northern peninsula of Michigan. Right across the state line lie the wet counties of Wisconsin.

*"Hollow wooden pedestals, loaded with booze, were mixed with shipments of solid mahogany, oak, and walnut, and enjoyed to the limit by the consignee. To keep them from seeming too light, two hollow ones were crated together."*

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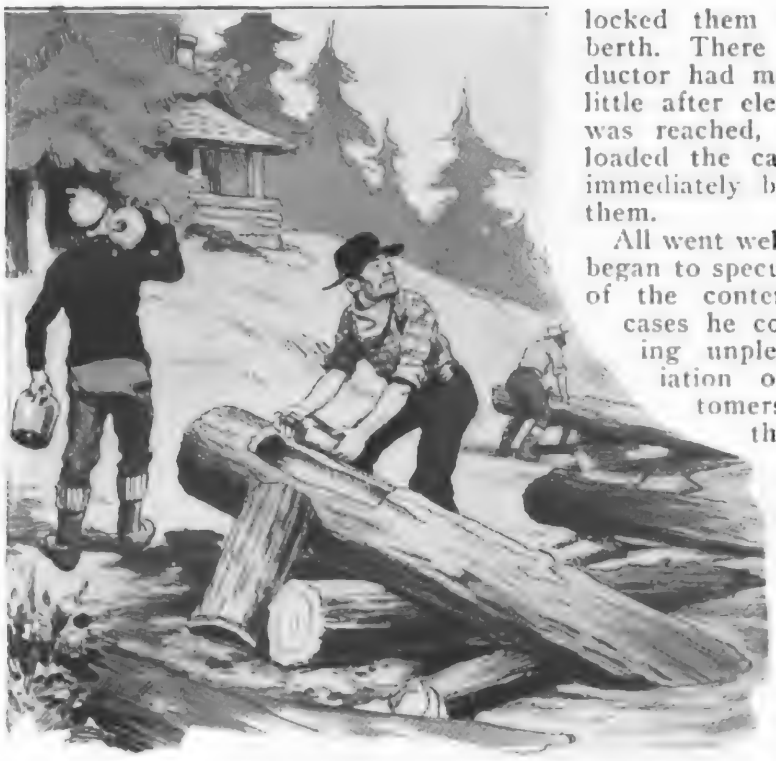

*"A lumberman . . . conceived the notion of hollowing out a portion of all the large logs he floated downstream. Before reaching the sawmill each log gave up its valuable cargo, which brought a high price in the forest districts. Fortunately for the officers who will have to watch, the physical boundaries of the United States offer few opportunities for this trick."*

A small river, used much for logging purposes in the past, flows through Michigan to empty into Lake Superior. A lumberman, with more ingenuity than consideration for the law, conceived the notion of hollowing out a portion of all the large logs he floated downstream. Before reaching the sawmill each log gave up its valuable cargo, which brought a high price in the forest districts. Fortunately for the officers who will have to watch, the physical boundaries of the United States offer few opportunities for this trick.

Except for the moral weakness of one link, a Missouri liquor dealer established a perfect chain for slipping gallons of "XXX" into Iowa. The weak link was the colored porter on an interstate express train, who acted as middleman.

Each time the train reached a certain Missouri point—to which it came about 9:30 at night—a man on the platform handed the porter two suitcases and a dollar bill. The money was the fee received by the darkey for his services.

Immediately he took in the cases, which were crammed with liquor, and locked them in an unoccupied upper berth. There they stayed until the conductor had made his last round. At a little after eleven, an Iowa way station was reached, and here the porter unloaded the cases; they were taken up immediately by a man who waited for them.

All went well until one night the porter began to speculate concerning how much of the contents of one of the suitcases he could extract without causing unpleasant comment or retaliation on the part of his customers. He tried half a pint; that seemed to go well and made no tremendous impression on the contents, although it livened up his thirst in great style. By the time he was through the next half pint, he was ready to sleep in the upper berth himself. There they found him, a few hours later, dead to the world, and with the booze of one case spilled all around him. Needless to say, the shippers were picked up on the next trip and the suitcase saloon went out of business.

The airplane right now furnishes possibilities in connection with booze-running that are interesting the Federal authorities tremendously. An airman flying from some point in Canada or Mexico with a load of liquor in his machine, can actually make deliveries to points not far removed from the border!

The mechanism for this accomplishment is not vastly different in shape from one of the explosive "pears" used in bombarding German bastions during the war. Each liquor bomb contains from five to ten gallons of booze, and is reinforced and given a piercing point. The latter operates so that when the airman is flying near the ground he can release the "pear" without fear of breaking it and spilling the contents. If it falls on soil it simply penetrates a short distance; the recipient can dig it out with ease. Of course, when a whole cargo of liquor is to be taken to a single point, the carrying is still simpler; the aviator receives it in a separate tank hung in the center of the fuselage, and does not attempt to discharge the liquor until he alights. This demands regular landing

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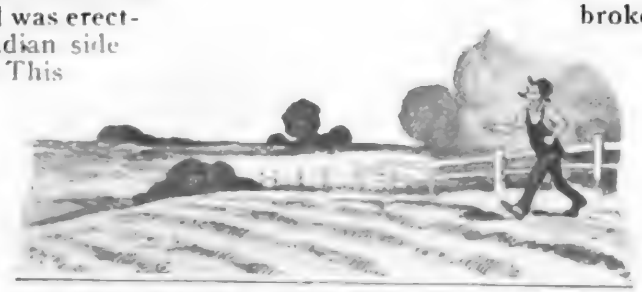
fields or open country well adapted to the taxi requirements of airplanes. With-al, we may look for the development of a whole fleet of liquor smugglers of the air, which will exist until the customs department establishes a regular airplane customs service, with recognized stations at which all incoming machines must stop.

As a comfort to people who see the country sinking into a state of lawlessness because of the open field for liquor smuggling, I wish to predict that no such thing will occur. Clever men may succeed for a time in hoodwinking the law, but even from the beginning it will be both difficult and expensive. As the months go on the difficulty will increase, expense will increase, and demand will drop off. Soon there will not be sufficient reward in the business to counterbalance the risk and expense, and liquor will be as dead as Tiglath-pileser.

If this sounds fishy, look at Detroit. Hundreds of business men in that city believed they could not live without liquor. So strong was this belief that an immense hotel was erected near the Canadian side on a small island. This hotel went up for just one purpose; it was going to house a tremendous week-end booze fight put on the map by thirsty Detroiters.

Did it? Yes, for three months! Then the "thirsty" business men who couldn't live without liquor found that merely going over for the week-end was too expensive and too troublesome. At the end of that time, the roster of guests had dwindled to nothing. The hotel now is closed, and it never will be opened again for the same purpose.

You may count as certain, in spite of the tempest in a teapot that now is going on, that booze has gone for good. It just isn't worth the trouble.



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## PLUNGE OVER CHALK CLIFF SURVIVED BY SOLDIER

Miraculously surviving after a fall of 320 ft. from the edge of a perpendicular chalk cliff, a Canadian soldier whose case has attracted considerable attention has no recollection of the events leading up to his experience, nor of his awful drop through space. The accident occurred near a hospital camp on the coast of France, and was witnessed by a party of French laborers who were at work near the spot where the man struck the beach. When picked up the victim was delirious, but not unconscious. An examination disclosed that his injuries consisted of a slight fracture of the skull, a large wound on the right knee, and several scalp wounds, besides minor bruises on various parts of the body.

Remarkably, none of the bones of the legs or arms was broken. After he had recovered the Canadian's mind was perfectly clear on everything in his past life except the events of the night on which he fell over the precipice. Medical authorities are of the opinion that the soldier was mentally unbalanced as a result of having been under condition he wandered unconsciously over the edge of the cliff.

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## LOCOMOTIVE CRANE LIFTS RAILROAD WATER TANK

Besides being almost indispensable for clearing wreck blocked tracks, locomotive cranes have been found valuable in other railroad work. In an Ohio town a large water tank was moved recently by one of these powerful machines to a new foundation a short distance from its original location. A chain, attached to the cable of the crane, was looped about the tank, and the crane lifted and swung its load into position without difficulty.

**Moving a Heavy Water Tank from an Old to a New Foundation Proved to Be an Easy Task for a Powerful Locomotive Crane**

## EUROPEAN AIR FIRMS PROPOSE ROUTES FOR SOUTH AMERICA

Several aerial enterprises, proposed by European air companies for South America, are typical of the activity that may be expected in that land of long distances and difficult travel. The Handley Page Company of Great Britain has offered to establish a service from Pernambuco south along the coast to Rio de Janeiro and Buenos Aires, this system to form the South American section of a projected transatlantic service. The same company proposes semiweekly air trips between the capital of Colombia, situated high in the mountains, and the ports on the Caribbean Sea. Vickers of England is interested in a similar scheme for Chile. The Italian firm of Caproni is responsible for the most ambitious project, however, suggesting a regular service between Chile and Genoa, Italy.

## LITTLE THRESHING MACHINE BOON TO SMALL FARMER

The latest product of a Michigan farm-implement factory seems likely to start an "own your own thresher" movement among farmers who have been dependent upon the convenience of a community machine. The new thresher is 19 ft. long and 8 ft. 5 in. high, weighing with all equipment 3,600 lb., and handling 150 bu. of grain an hour. A tractor, 16 hp. or over, will run it. The threshing mechanism

**This Grain Thresher is Expected to Prove Popular with the Small Farmer, as It will Make Him Independent of the Larger Traveling Machines, Whose Operators Dislike Stopping for Anything but Big Crops**

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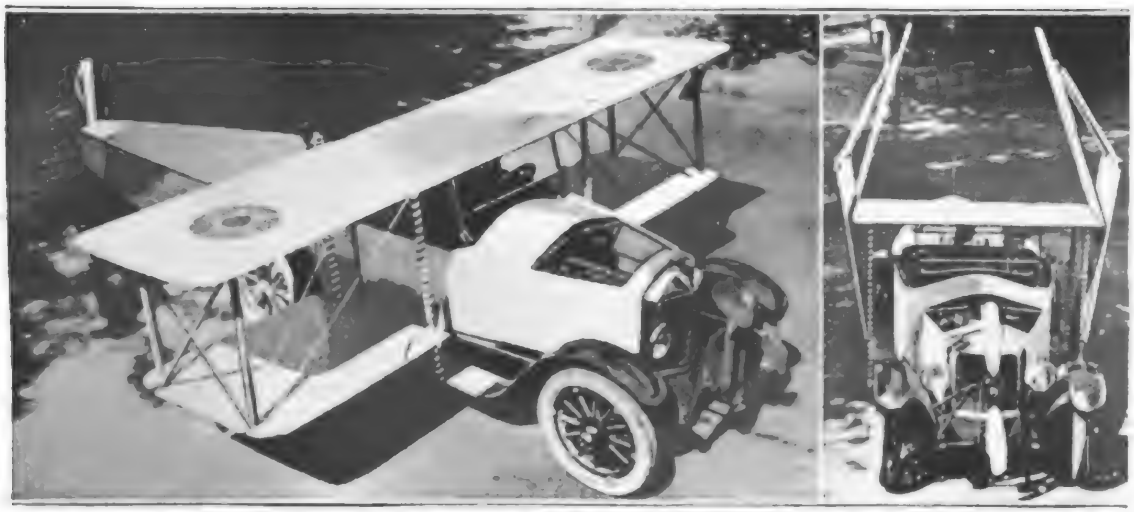

This Automobile has been Inclosed in a Streamlined Fuselage. Through the Radiator Projects a Shaft Bearing a Propeller, and at the Driver's Right Hand Is a Lever Which Opens and Locks the Wings, or Folds Them Snugly against the Body. While This Combination of Land and Air Craft Is Now Only an Experiment, the Constructor Hopes Eventually to Travel as Easily in One Element as in the Other

is unusual, consisting of four claws on arms revolved by a crankshaft at 228 r.p.m., stripping the grain as it passes between them. The elevator arm is adjustable to any height of wagon bed for direct loading. With this individual-sized implement, the farmer has only himself to blame if his crop is not threshed at the proper time.

## SWIMMING RACE AT PARIS WON BY AMERICAN

Great crowds along the banks of the River Seine recently watched an American soldier win the international swimming race across Paris, covering the distance of approximately four miles in 1 hr. 30 min. The victor's powerful, easy style was applauded repeatedly as he rapidly overcame the handicap of 500 meters (about 550 yd.) allowed the women contestants, and later crossed the line in an exciting finish just four-fifths of a second ahead of an Italian contestant.

## FOLDING WINGS TRANSFORM AUTOMOBILE INTO AIRPLANE

A vehicle adapted to travel both on land and in the air is not a new idea, as motorcycles with folding wings have been suggested and designed in America and Europe. But to a citizen of Pennsylvania goes the credit for the most ambitious attempt in this line to date. His prodigy was first revealed to the public as part of a recent patriotic parade. The auto body was seen to be replaced by a streamlined fuselage. Through the radiator projects a shaft bearing an air propeller. By the driver's seat rises a lever which folds the wings flush against the body for travel on land, or extends them for flight.

## PINE CONES USED AS FUEL IN SPANISH CITIES

Ordinary fuel has become so scarce in some parts of Spain that pine cones are being sold as a substitute for coal and wood in a number of cities. Peddlers deal in the scaly forest product,

Pine Cones Are the Stock in Trade of This Spanish Peddler. He Sells Them as a Substitute for Coal and Wood, Scarce Fuels in Spain Just Now

which they bring to market in enormous nets fastened to their mule-drawn carts.

¶Another midget airplane, reported from France, measures a little less than nine feet long, and is equipped with two 3-hp. engines, each driving a pusher propeller.

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# WORLD AWAITS GLOBE-CIRCLING FLIGHT BY MAGELLAN OF THE AIR

By PAUL A. JENKINS

"ON Monday, October 7, at 1:53 a. m., we alighted at our starting point in New York City, having reduced the time required for a flight around the globe to 13 days, 9 hours, and 22 minutes. With the exception of one replaced at Archangel, Russia, our 14 engines functioned faultlessly throughout the entire journey of 30,247 land miles. Our navigating officers express themselves as well pleased with the new automatic wireless mechanism which freed them from the usual tiresome turns at the controls."

The noteworthy feature of this bit of fiction is its entire plausibility. The reader of 20 years ago would have passed it by as a senseless dream. The reader of today is interested. He has seen the Atlantic spanned by air three times in less than two months, the last time by a monster dirigible already considered obsolete. During the war he traced the 7,000-mile nonstop cruise of a German Zeppelin from its start in the Balkans to German East Africa and return. He had seen in newspapers casual mention of flights by British biplanes from England to India.

The Cover of This Month's Popular Mechanics Magazine is Not Intended Primarily as a Prophecy of Achievement, but As a Symbol of the Spirit Which Impels Aviation's Pioneers, Even Now, to Heroic Trials and Demonstrations. Just So, a Flight Like the One Pictured will Be First of All a Dramatic Symbol of Man's Enlarging Freedom from the Tyranny of Time and Space

The modern reader, thus educated to the unusual, grants the possibility of a world-girdling flight. But the veteran airman declares it could be done tomorrow as far as the technical arrangements are concerned. Only the money and organization are lacking. And these not for long. The great air-craft producers, with the air services of the world powers, know that the feat will be a tremendous advertisement for an activity that needs advertising above all things. Already lacking the stimulus of war-time competition, the science of aeronautics will languish and die without the interest and support of the general public. Surely the professional enthusiasm and skill which have filled the last ten years with splendid achievement will not shrink from this culminating demonstration.

The first flight around the world will probably be made by a dirigible. Despite scores of miserable failures, millions of dollars lost in ships burned, collapsed, and shot down like great lumbering cattle of the air, the "Zeppelin" type has survived — survived to be recognized as the ideal vehicle for long-distance aerial transport, with its ability to make long nonstop voyages, to cruise with half or all of its power plants gone. The dirigible is reliable, too, and comfortable; and in size, lifting power, and speed limited only by the desires and resources of its constructor. The early construction of a 1,000-ft. dirigible is almost certain.

Clear-sighted experts, gathered at New York to welcome the officers of the "R-34," spoke time and again of a world-circling flight by dirigible. They pictured a supercraft five times as large as the "R-34," rated at 100 miles an hour, and carrying 200 tons of passengers, mail, and freight. A ship of this size and speed, with cargo space devoted to fuel and lubricants, and powered by a dozen



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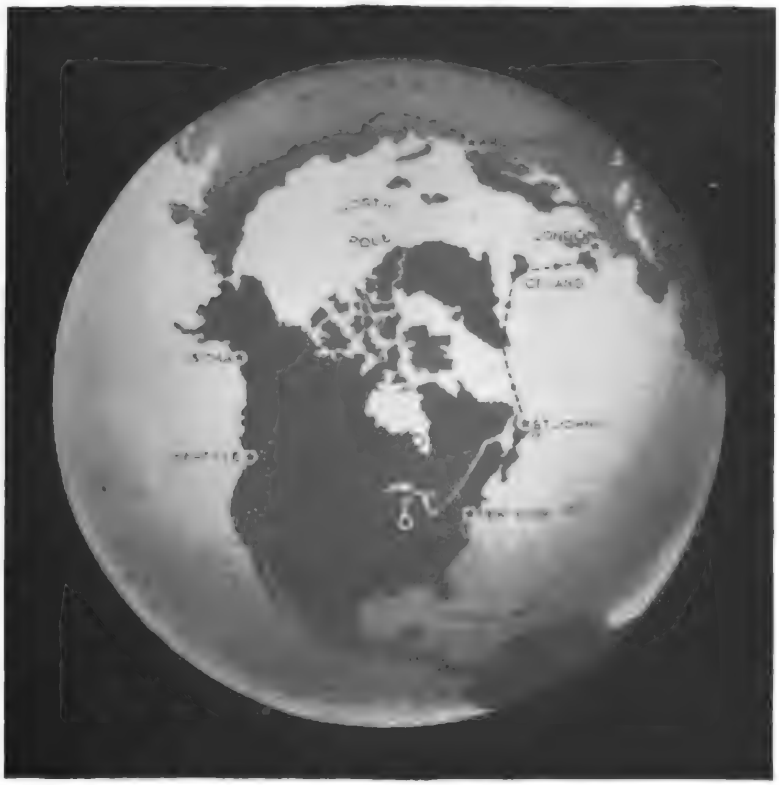
sturdy engines, should experience little difficulty in making the trip. The mammoth craft is certain to be built within the next few years, too.

Such a monster ship, on its pioneering voyage round the world, will be remarkably independent of terrain and local weather disturbances. Yet, to make success a certainty, certain preparations will be necessary. Weather observers scattered over the earth on sea and land will be asked to cooperate in piecing out the great air map already begun for the Atlantic and the United States. To coördinate this work for instant reference, meteorological stations with high wireless towers will be planted in the Far East and on the scattered islands of the Pacific. These same towers will then guide the world-circling dirigible like the lighthouses do the seafarer. Working with the wireless direction finder in the navigator's cabin, they will inform him of his position at any moment. A dozen repair and refueling stations—no more—will be organized at selected points along the great circuit. Intended only as temporary stopping places, they will be fitted with the mooring towers reported to be used even now by the British.



The Projected Circumnavigation of the Globe by an American Army Biplane may Involve This Routing, Easily Seen to Be Less Than a Great Circle of Earth. It Is Interesting to Compare This Itinerary with That Illustrated in Popular Mechanics Magazine for April, 1914, as the Route for the Proposed Race around the World. The Two will be Found Almost Identical in Many Sections

So much for the dirigible, destined to be the long-distance cargo carrier, the commodious and comfortable cruiser of the air. Interest turns even more eagerly to the swifter airplane, depending on speed for its very being, peculiarly the product of our hustling twentieth century.

And here our own army air service has already been at work, busy with plans, though denied achievement by an unappropriating congress. It is unofficially announced that, with proper support, the flight will be attempted by airplane before the end of this year. The bimotored Martin bomber will probably be the plane used, in view of its selection for the contemplated daylight journey from coast to coast. Some parts of the projected itinerary are hardly what one would expect. Starting from the Atlantic coast, the first lap will end in Newfoundland, the second in Greenland or Iceland, and the next in Ireland. Thence the flight will continue to France, to Norway, and east to Archangel, Russia. Then along the northern coast of Siberia, where ships will land with supplies. Crossing the Bering Sea the airmen will traverse Alaska, turn down the Canadian coast to Seattle, and thence to their starting point.

And in an age when anything may be predicted with the chance of its coming true, why not the prediction of a nonstop airplane flight around our dwindling globe, as suggested by this month's cover of Popular Mechanics Magazine? Airplanes as we know them are limited in performance by inherent necessities of design; but why not refuel the world-girdler by means of dangling tubes from the other planes as suggested by Lieutenant Locklear? The impossibility of today becomes the commonplace of tomorrow.

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## BANK DESK LESSENS LABOR AND SAVES FLOOR SPACE

For the use of the bookkeeper has been designed a desk which effects a saving in both floor space and working time. By lowering the top it becomes a "standing" desk for sorting checks and similar operations. By raising the top, the bookkeeper secludes himself in a miniature alcove, with two capacious drawers at his left, and on his right a shelf which supports ledger rack and ledger. Before him is the adding machine on its stand. The manufacturer of these desks supplies them in various dimensions.

The Bank Desk is Here Shown with the Top Down in Position for "Standing" Work, Like Sorting Checks. For Other Work the Bookkeeper Raises the Top and Takes His Seat. On His Right and Left Are Broad Shelves; before Him Is the Adding Machine

## GOVERNMENT FABRIC TESTS PROVE DEPENDABLE

In spite of the haste in which it was necessary to do the work, War Department tests of material purchased by the government during the war for tents and clothing proved to be dependable. Modified forms of the bag, or funnel, and spray tests were used to determine the water-resisting qualities of canvas for tents, and the latter test was found to give more accurate information. Actual service showed the correctness of the results obtained by these means. It was found that the absorbent qualities of canvas had little or nothing to do with its value as a tent material.

## PLAN INTERNATIONAL ROAD TO CONNECT AMERICAS

Connecting the United States with the countries of South America by means of an improved highway for automobiles, is the plan proposed by a New Mexico man for consideration by the Pan-American Union conference, which met in Washington, D. C., recently. Such an international road would run between El Paso, Tex., and Bogota, Colombia, if built according to the plan outlined by its promotor, and would pass through Mexico and the Central American republics. Work is being done at the present time on a highway between El Paso and Mexico City, the federal government of Mexico and the governors of several Mexican states coöperating with Americans in its construction. With this road completed, a considerable portion of the proposed link between the Americas would be a reality.

## NEW PROCESS FOR COATING IRON WITH LEAD

Lead as a coating for sheet iron and other articles of the same material is declared to give satisfactory results if applied according to a new process. After being washed and otherwise prepared, the material to be coated is dipped into a solution of antimony chloride, and then through a suitable flux, floating on top of the molten metal, into the latter, the purpose of the flux being to cause the lead or antimony-lead to adhere. After being immersed in the lead bath, the article is submerged in oil. Material treated in this way can be bent without breaking the coating and exposing the metal underneath, according to the inventors of this new process. Sheet-iron shingles treated in this manner were exposed to the elements for two years and 11 months, but showed no signs of rust at the end of that period, though some were not painted. The process is cheaper, it is said, than galvanizing or tinplating.

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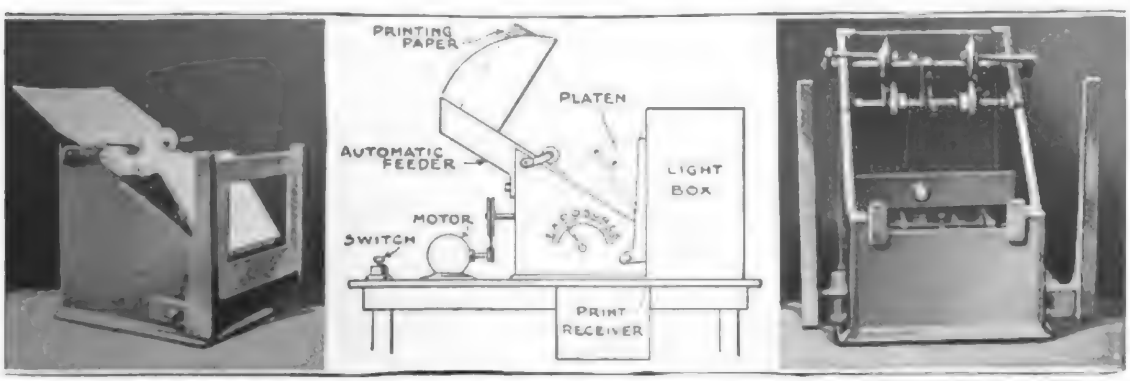
## DESKLIKE PHONOGRAPH FINDS PLACE IN MUSIC STORE

To stimulate his sale of talking-machine records a music dealer has equipped his store with an odd phonograph. In appearance it is not dissimilar to the ordinary writing desk, with the motor-driven disk occupying most of the writing surface. On the left is a rack for the records, from which the customer is to make his selection; others on the right hold records selected and rejected. A small rack at the back contains announcements and advertising literature. The machine increases the efficiency of his salesmen by permitting customers to wait upon themselves.

A Music Dealer has Found Customers More Easily and Quickly Satisfied Since He Installed a Number of These Convenient Phonograph Desks in His Shop. As Seen More Clearly at the Left, the Motor-Driven Disk is Placed in the Center, with Racks at Right and Left to Hold Records on Trial and Records Selected. Other Racks Hold Advertising Matter and Musical Announcements

## HIGH-SPEED PHOTO PRINTER WORKS LIKE PRESS

When the mechanical ingenuities of one art can be transferred to another, surprising results are often attained. A Wisconsin pressman has devised a remarkable photo-printing machine which operates practically on the principle of a printing press. When a stack of sensitized cards or paper is placed in the hopper, the negative clamped to the vertical glass front, and the electric motor started, the cards are automatically fed onto a platen, pressed against the negative, exposed to the light from three 40-watt lamps, and dropped into a rack.




The Action of the Photograph "Printing Press" will be Clearly Seen from the Diagram. As Each Sensitized Card is Pressed against the Negative Three Powerful Electric Bulbs Flash in the "Light Box." The Feeder and "Light Box" have been Removed at the Left. The Right-Hand View Shows the Central Shaft from Which the Entire Apparatus is Operated

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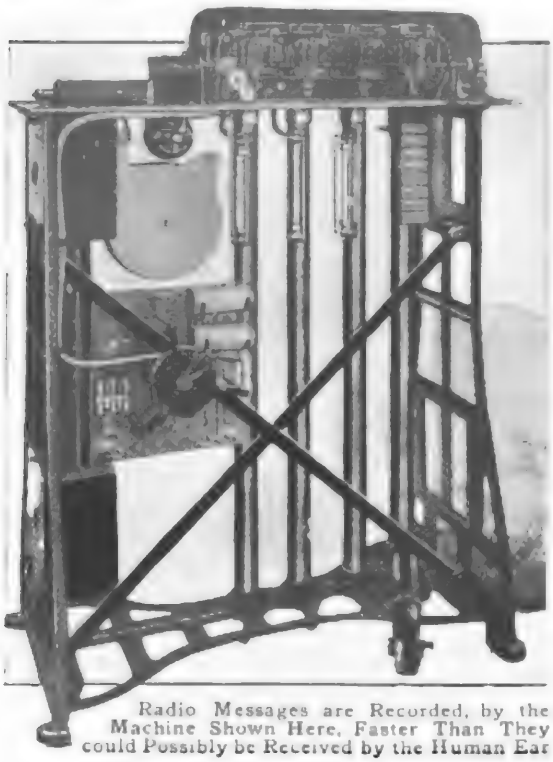
The length of time the lamps burn for each exposure is regulated by a dial. At the normal shaft speed of 2,700 r.p.m., the capacity is 3,000 prints an hour, up to 6½ by 8½-in. size. It can also print three post cards at one time, or 9,000 an hour.

## WIRELESS RECEIVER PRINTS MESSAGES ON TAPE

Feeding its tape into a basket like a magnified stock ticker, a newly developed wireless-telegraph receiver prints dots and



Radio Messages are Recorded, by the Machine Shown Here, Faster Than They could Possibly be Received by the Human Ear

dashes at the rate of 400 words a minute, and has a trial record of 600. Not only is this an entirely new speed for radio reception, but since no human ear can interpret a message delivered at that rate, the speeded-up transmission becomes secret, except to stations equipped with the

A Section of the Sensitized Tape upon Which Dots and Dashes are Printed by the Wireless-Telegram Receiver

recording device. The tape may be filed as a permanent record.

The process is photographic. The receiver contains 1,000 ft. of sensitized tape, upon which a mirror of minute size, oscillated by the electric impulses, imprints the dots and dashes of the message, in a form easily deciphered. An electric motor draws the tape through a series of four vertical tubes, containing, in order, developer, fixing hypo, washing water, and, last, a drying oven. The full tape takes a 10,000-word message averaging roughly a word to the inch. While the impulses are being printed, they are also visible as flashes on a ground glass.

With this device some success has been attained in the reception of two separate messages at one time from the same antenna, promising the possibility of a multiplex system of radio.

## ATLANTIC-FLIGHT ENTRIES MEET CROWNING MISHAPS

Airmen Hawker and Alcock seem to have taken with them Newfoundland's entire supply of horseshoes. After their departure, their former rivals, the Handley Page and the Martinsyde, suffered nothing but misfortune. The first was wrecked during an attempted flight to Mineola, L. I., for the purpose of welcoming the "R-34." In the darkness over Nova Scotia, a broken connecting rod disabled one engine and compelled the crew to descend. They cruised two and a half hours over a little town on the Bay of Fundy, awaiting the dawn. At five in the morning the plane touched ground, tore through several unnoticed fences, and was finally tipped on its nose by a stunted spruce tree. Back in Newfoundland, several days later, Raynham attempted a second start in his rebuilt Martinsyde. But he carried too much gasoline, and after a 50-yd. "hop" crashed heavily to earth.

## LOST SHIP EASILY LOCATED BY MODERN RADIO METHOD

In these days of the radio compass and instant wireless communication, a ship at sea is in little danger of losing its way. Recently the "Louisville Bridge" lost its bearings in a heavy fog off the coast of New Jersey, and was unable to find Ambrose Channel into New York Harbor. The operator called the navy yard, and within five minutes received the answer. "Your true bearing at 4:43 p. m. from Rockaway Beach two-hundred ten, Sandy Hook sixty-seven, Mantolocking fifteen." The auto tourist asking the best route to town could hope for no more definite information than that.

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# BEES' STINGERS MAKE PROFITABLE CROP

By SAM E. CONNER

RAISING bees for the stings pays an eastern woman better than keeping them for the honey which they would produce. From these stings is secured the purest formic acid obtainable, and the customers are the manufacturing druggists of the country. During the past 24 years this woman has supplied one firm with 25,000 stings annually; other concerns take from 500 to 5,000 each year, making a yearly trade of 50,000 stings. To produce this number, but two colonies of bees are necessary, while it would require 50 colonies to make an amount of honey equal in value to the stings.

Through the Sale of Stingers from Two Colonies of Bees This Woman Obtains as Much Revenue as She would from 50 Colonies Kept for Their Honey. She Sells Some 50,000 Stingers a Year. The Picture Shows One of the Hives

The method of taking the sting from a bee is simple. The bees are first gathered in a specially arranged box, by shaking a comb on which they are working over the mouth of the box. Next, in a room with all the shades but one drawn, the box is opened. As the bees come out of the box they are attracted to the lighted window, and cluster there on glass or screen. Mrs. Beekeeper picks up the insects by their heads and, holding them under a magnifying glass, draws the stings. For this purpose a small pair of tweezers is used. The stings are placed in a dish filled with milk sugar, which covers them with a coat that prevents decay.

Stingers are Drawn from Bees with a Small Pair of Tweezers and Sold to Manufacturing Druggists, Who Make from Them Formic Acid, Used in the Treatment of Rheumatism, and Other Ailments

The Bees are Shaken from the Comb into a Box and Taken to a Dark Room for Removal of the Stingers

Each sting contains a small amount of formic acid, which is removed by distillation. This acid is used in the treatment of rheumatism by homeopathic physicians, being administered in much reduced strength, while doctors of the regular school use it, reduced one-half, for restoring circulation in cases of paralysis, applying it externally. Formic acid was one of the first of the solid-fat acids discovered. It was originally obtained by distilling common red ants (*Formica rufa*) from which the name is derived.

The owner of this unusual business has only been severely stung once in all the years she has kept and handled bees. That time she suffered no serious results. She is frequently stung by a bee through negligence on her own part, however.

## ROOSEVELT-MEMORIAL DRIVE NATIONAL IN SCOPE

A plan to create a suitable national memorial to the late Theodore Roosevelt has been launched and will culminate in a campaign for funds from October 16 to 29, it is announced. The project contemplates a monument in Washington, D. C.; a park at Oyster Bay, to include, eventually, Colonel Roosevelt's home at Sagamore Hill, and the formation of an association to foster and perpetuate the Roosevelt ideals.



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## WHIRLING SPRAYERS SUPPLANT TRENCHES IN FRUIT ORCHARDS

Owners of several fruit orchards are using tall revolving sprayers for irrigation, believing them more efficient than the conventional ground trenches. The typical sprayer is fed by a 2-in. hose, water issuing from two whirling arms above the tree tops, on which it falls in a 150-ft. circle. Evenness of distribution and freedom from water waste recommend this system. In addition, water falls on the leaves like rain, washing away the dust and stimulating growth. The sprayers are mounted on wheels for easy transportation about the orchards.

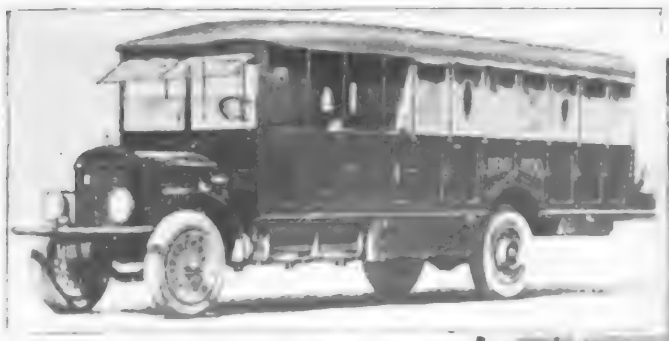
**Tall Whirling Sprayers are being Used by Many Fruit Growers to Distribute Irrigation Water. They Claim Efficient Irrigation and Conservation of Water as Advantages of the Method**

## INTERNATIONAL CABLE CODE PRINTED IN NINE TONGUES

International trade is expected to be encouraged by a new cable-message code system that makes possible decoding in nine different languages without translation. Several hundred linguists and commercial experts have been at work on the code book for the last three years, and it is considered complete in every respect. The languages are English, French, Spanish, Portuguese, Italian, German, Dutch, Japanese, and Russian. Business firms employing this code book will find it an easy task to decipher a message into any of these languages. Figures can be sent in a condensed form, thus adding economy to the other advantages of the system. It is also possible to condense the words in a message, a single code word representing a complete sentence.

## FAMILY AUTO TRUCK IS LIKE PALACE SLEEPING CAR

Designers of special auto bodies evidently are striving to achieve the limit of luxury on wheels. Now the president of an Indiana motor concern has made a two-ton truck into a veritable rolling hotel, with sleeping compartments for four persons inside, and a comfortable berth in front for the driver. All conveniences, such as kitchen facilities, light and water supply, are provided, and there are plenty of lockers and regular windows.



**A Commodious Dwelling on Wheels: This Special Body, Placed on a Two-Ton Truck, Has All the Conveniences of a Home, and will Accommodate Four Persons**

**Interior of the Motorized Hotel: This Picture Shows the Wide, Comfortable Berths. Besides, There Is a Kitchen, and Electric Lights and Running Water are Provided**

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# BLAZING DIRIGIBLE CRASHES THROUGH BANK ROOF

THE city of Chicago was thrilled with pitying horror several days ago when a dirigible balloon caught fire above the business district; collapsed, and fell. The fuselage and engines crashed through a skylight into the rotunda of a bank, which the bursting gasoline tanks transformed at once into a roaring blast furnace. Flames searched every corner, charring nine men and women, several beyond recognition, and injuring a score of others. The dirigible was of the nonrigid type, about 160 feet long, with a 35-foot gondola slung underneath. Power was supplied by two 80-horsepower rotary motors, believed to be the first of their kind to be used in this way. After flying intermittently above the city for several hours the balloon headed for its hangar late in the afternoon. Speeding 50 miles an hour at a height of 1,200 feet, the silvery bag was suddenly seen by thousands to flame, buckle, and plunge downward in a headlong, blazing fall. Two of the crew of five survived the parachute drop. The photograph above was taken just a few moments before the "Wingfoot Air Express" rose from Chicago's lakefront for its disastrous voyage. Below appears a detailed view of the gondola with the fortunate member of the crew seated on its edge. The parachutes hang along the sides in their waterproof casings.

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# STRANGE WAS THE FATE THAT DROPPED THE "BLIMP"

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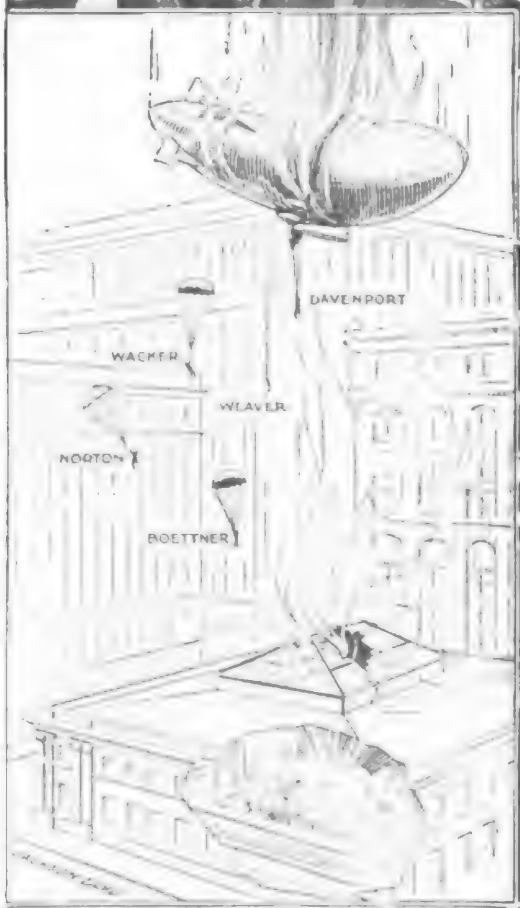
The Investigation by the States Attorney has Concerned Itself in Large Measure with These Two 80-Horsepower Rotary Motors. The Use of This Type on Dirigibles is Declared Highly Dangerous by Many. One of the Two Mechanics in the Crew is Shown with a Blowtorch Removing Oil from the Engine Hoods Just before the Start of the Fatal Flight




This Diagrammatic Sketch of the Accident Depicts the Fate of the Occupants. Davenport's Parachute Tangled in the Rigging; Weaver's Burned; Wacker and Norton were Broken on Landing; Only Pilot Boettner Reached the Ground Unharmed

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This Tangled Heap of Twisted Metal Is the Remains of One Engine. Although Many Lay the Responsibility for the Disaster on the Engines, an Army Expert Ascribes the Explosion to Friction between the Silk Ballonettes in the Envelope



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# UPON CHICAGO'S ONLY TWO-STORY LOOP BUILDING

This Photograph was Taken Just a Few Moments after the Unprecedented Disaster Which Claimed Thirteen Lives and a Score Injured. Firemen and Other Rescuers have Reached the Roof of the Bank Building and are Preparing to Train a Hose on the Dying Flames Below. The Shattered Skylight is Still Dotted with Patches of Smoking Fabric, as a Physician Busies Himself with the Charred, Broken Body of the Unfortunate Whose Parachute Failed to Open. Firemen and Police, Aided by Soldier Volunteers, Are at Work Meanwhile in the Rotunda, Removing the Mutilated Bodies of the Dead and Injured

This Is the Rotunda of the Illinois Trust and Savings Bank, Directly beneath the Skylight: Here Worked 150 Bookkeepers and Stenographers, Most of Whom Were Women. Some were Crushed by the Impact of the Motors and Tanks; Others, in a Frantic Dash for the Cage Exits, were Consumed by Blazing Oil Which Ate into Cloth and Flesh; Many were Slashed by the Torrent of Broken Glass from the Skylight. Roaring Flames Seemed to Seek Out Every Corner of the Spacious Interior, Marring Walls and Floors, Even Cracking Costly Marble Pillars. The Intense Heat Made Rescue Work Impossible, in Some Cases for 30 Minutes

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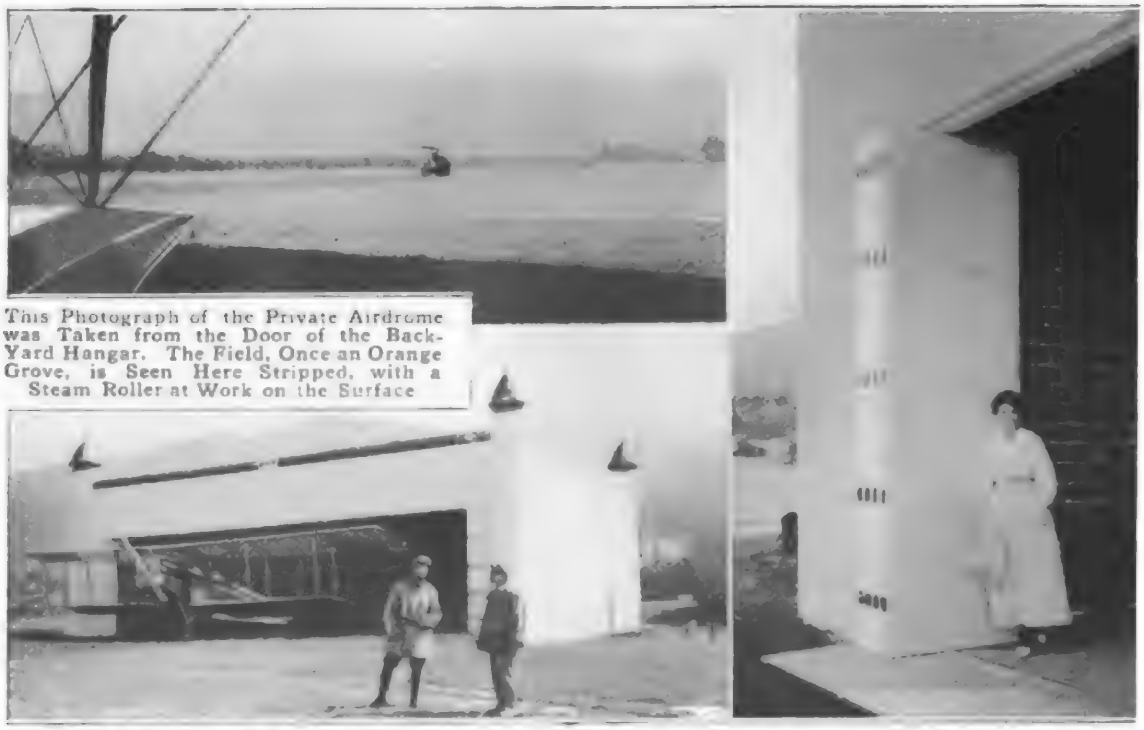

This Photograph of the Private Airdrome was Taken from the Door of the Back-Yard Hangar. The Field, Once an Orange Grove, is Seen Here Stripped, with a Steam Roller at Work on the Surface

**Following His Decision to Use an Airplane for Visits to His Extensive Property Holdings, an Enterprising Bank President Ordered the Erection on His Suburban Estate of the Hangar at the Left. The Structure Is of Brick and Concrete, with Bellows Doors Which Collapse to Leave the Entire Front Unobstructed, as Seen at the Right. An Ex-Army Airman Pilots the Owner on His Trips**

## BRITAIN ASKS UNIFORM SKILL OF WOMEN MOTOR DRIVERS

British women who volunteered for work in the army service corps were put through a course of field training before they were assigned to their regular duties. Numbers of volunteer chauffeuses were thus trained daily in a great London park. Here they were eventually subjected to several practical tests, among them one to try their judgment of distance. Two broad hurdles were placed facing each other and separated by a little more than the width of the car, and the test consisted in driving through this narrow gate without touching the hurdles.

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**This Test of Skill was Required of Britain's Women Motor Drivers. The Machine can be Driven through the Narrow Gate Only by a Practiced Hand**

## BUSINESS MAN OWNS PRIVATE HANGAR AND LANDING FIELD

Scarcely less impressive than the first transatlantic flight is the first back-yard aerodrome, when viewed as an indication of the public's growing interest in aeronautics. It is situated on the grounds of a suburban home maintained by a western bank president. To form the landing field he ordered an orange field grubbed out and leveled with a steam roller. On one side he built a hangar of brick and concrete, with bellows doors which collapse to leave the entire front of the hangar unobstructed. The necessity of frequent visits to land holdings in a distant county impelled him to take these steps. The tedious 250-mile journey over mountains and desert has previously taken three days; but with his airplane will be made in five hours or less. His pilot, a former lieutenant in the army air service, has already driven him on trips to the city, to the golf links, and to near-by beach resorts.

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¶A British airman recently flew in one day from Mosul on the upper Tigris, over the Syrian Desert, to Cairo on the Nile, making three stops on the journey of 1,100 miles.

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# "MENSURGRAPHY:" A PHOTOGRAPHIC METHOD OF STUDYING DEFORMITIES

By ROBERT H. MOULTON

A NEW method of making true records of changes in the external appearance of the body, which not only promises valuable aid in the child-welfare program, but will undoubtedly also interest military and police authorities as well as physicians, has been developed by a New York City physician. This method, which the originator calls "mensurgraphy," has just been announced to the medical fraternity, although it now appears that the army medical service has been using it for some time.

With the "Mensurgraph" This Face may be Analyzed and Measured to the Twelfth of an Inch, Suggesting Its Use in Recording Criminal Physiognomies

Briefly, the system of mensurgraphy consists in using the camera as an instrument of precision. The photographic records made of the external appearance of the body at different times, are taken under exactly the same conditions of light, distance, and position of the subject; and by comparing pictures taken at different periods it is possible to learn what changes have occurred in the intervals.

This Photograph was Printed without the Use of the Squared Scale, Giving an Unobstructed General View of the Subject

These measure-picture records should be of great value in observing the progress of improvement of orthopedic cases of all types. For instance, a stooping attitude and its correction might be graphically shown in lateral pictures, with the difference in the line of balance in the two postures. A stiff knee joint may be illustrated, and its improvement shown better by mensurgraphy than by any number of tape measurements. Incorrect postures at a school desk may also be recorded by this method. In fact, its use seems almost unlimited as a means by which the least tendency to drop below the normal standard of bodily fitness may be detected and, through corrective agencies and exercises, removed.

While other physicians have used the camera for making physical measurements of subjects under study, the records so secured were not reliable for the reason that the camera itself is not altogether trustworthy, for, as students of photography know, many things may cause the lens to distort and fail to produce a faithful image; the power and source of the light, the direction from which the light comes, the position of the subject, the care with which the focusing is done, being among them.

The way in which the mensurgraph photographs are taken is interesting. For lighting his studio, the physician employs a mercury-vapor arc lamp, thus insuring a uniform degree of illumination at all times. This light, being very rich in ultraviolet rays, enables him to make instantaneous exposures, so that any possibility of movement on the part of the subject while the photographs are taken is precluded.

A white stool has painted upon it two sets of black footprints; one set facing toward the front, and the second at right angles to the former. A person standing upon the first set would, therefore, face the camera, while when he stands upon the second

The Measuring Lines have Now been Imposed on the Negative, Permitting Accurate Measurement of Deviations from Normal



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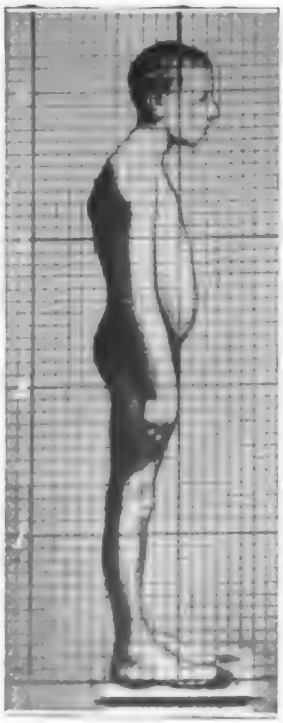
set he presents a profile to the camera, which is placed at a fixed distance and height in front of the stool. This distance was determined by experiments, the focus of the lens being an important factor in determining it. Thus, with a lens of 9½-in. focus, it was found that the camera must be placed 10 ft. 4 in. in front of the stool, and 4 ft. 1½ in. from the floor. These distances are marked by two small tacks driven into the floor, and the points are located by means of plumb bobs attached to both the stool and the camera. This is to insure that the size of the person photographed should bear a simple relation to the size of the image on the camera's ground glass. With the subject and camera so arranged a child, 4 ft. 5 in. tall, will, when placed on the stool, measure 4⅝ in. on the ground glass.

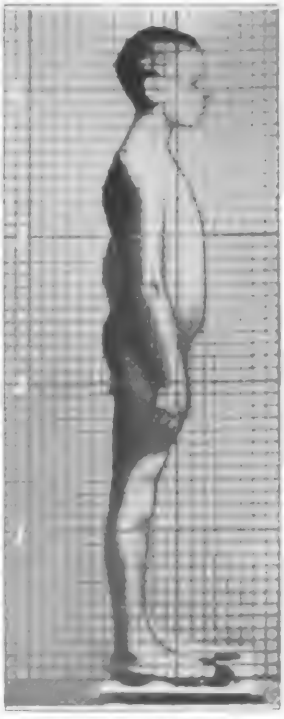


A Record of Defective Carriage, to be Compared with the Lower Picture

Across the front of the white stool are painted two black lines, one horizontal and the other at right angles to it, the two thus forming a large "T." By this means it is easily ascertained that the ground glass and the subject are in register.

The subject is placed on the stool, with his feet fitting into one set of the painted footprints, and photographed in the ordinary way on a 5 by 7-in. plate, except, of course, that extraordinary care is used to secure a maximum of definition and a minimum of distortion. The manner of printing from the negative is really the key to the method of mensurgraphy.

Before the sensitized sheet of paper is printed, a screen, or scale, consisting of a semi-opaque substance on which are drawn transparent lines, with two cross hairs at the bottom, is placed over the face of the negative. The cross hairs on this screen are placed in exact register with the cross-hair lines, or T-figure, on the stool, as they appear in the negative, the result being a scale of squares, representing inches, upon the print. The screen in place, the paper is exposed in the ordinary way, and the subsequent development gives a print in which the subject is seen standing behind a network of black lines. It is then possible to locate and accurately measure every outward phase of the physique.



"Mensurgraphy" Shows Exactly How the Subject was Benefited by Proper Exercise. The Increase in Height may be Accurately Measured by Reference to the Horizontal Lines

The value of mensurgraphy lies, of course, in the comparative study of a series of pictures taken at regular intervals. The screen lines will always appear in the same places on the body, unless the subject has undergone some outward change since the preceding photograph was made, and in this case the lines reveal the exact direction and degree of the change.

If it is desired to secure an even finer measurement of any individual portion of the subject, an enlargement is made of that part of the body. Taking the face, for example, we may find that it measures 8 in. from the top of the head to the point of the chin, as shown by the squares in one of the illustrations. An enlargement is then made, which, when measured by rule, is exactly 8 in. Upon this enlargement is placed a large, ruled screen, divided into s q u a r e inches, each s q u a r e subdivided into twelfths of an inch. Thus it is possible to measure developmental changes, deformities, skin lesions, or other morbid formations, to the one-twelfth of an inch, and a means provided of permanently recording their growth or abatement.

While our military authorities have not yet announced the manner in which they have used mensurgraphy, it seems likely that it was employed to show bodily changes due to the physical training the soldiers received. In police work it affords a means of identification.

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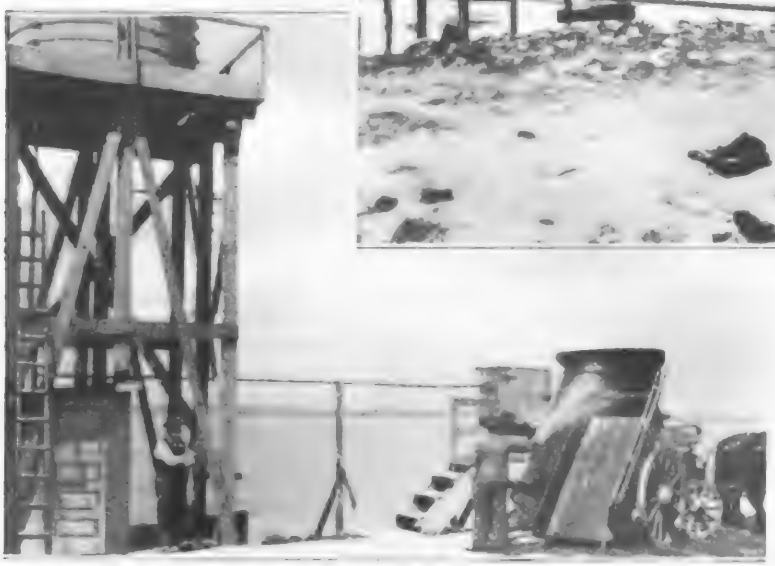
# COAST CITY SOLVES PROBLEM OF GARBAGE DISPOSAL

A large west-coast city has solved its garbage-disposal problem in a simple but effective way. The refuse is carried in the usual scavenger wagons to a remote section of the city beach. Here it is dumped, and instantly covered with a thick layer of sand pumped from the bay by a small electric dredge. A merit of this method is that many acres of land are reclaimed from the ocean each year. The city makes further use of its natural advantages by having each driver wash his emptied wagon with sea water at a pumping station installed near the dump, before returning to the city. This salt bath frees the wagons from offensive odors and the fly nuisance for their return trip through the city streets.

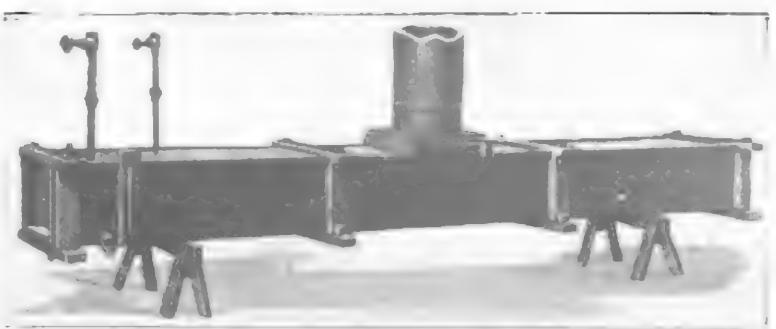
Sand Pumped through This Pipe Line is Used to Cover City Garbage, and Incidentally to Reclaim Much Good Land, as in the Foreground



A Secondary Feature of the City's Simple Garbage-Disposal Plan Is This Use of Salt Water to Cleanse the Wagons. Washed Immediately after Dumping, the Wagons are Thus Freed from Flies and Odor, for Their Return to the City

## STEAM CIDER EVAPORATOR MAKES APPLE JELLY

Apple cider is converted into jelly, or prepared for bottling, in a brief time and without danger of burning, by a steam evaporator of simple construction now being used in apple-growing sections. The apparatus consists of a covered wooden trough, in which are copper-tube coils for the passage of steam when the evaporator is in operation. A partition in the trough extends from one end to within a few inches of the opposite end, and cider, entering the trough at the end where the partition joins, is forced to travel in a circuitous route over the coils to reach the outlet, which is at the same end of the trough as the inlet but on the opposite side of the partition. Vapor generated in the process is carried away by a vertical wooden pipe set in the center of the trough cover.



In This Simple Steam Evaporator Apple Cider is Quickly Made into Jelly or Prepared for Bottling. Annealed-Copper Tube Coils, inside a Covered Wooden Trough, Heat the Cider, Steam being Admitted through the Pipe at the Left

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## FARM TRUCK HAS APPLIANCES FOR HANDLING FERTILIZER

Motor-truck bodies designed for special uses are coming more and more into evidence. One recently assembled on a six-ton chassis for the handling of farm fertilizer is equipped with a loading crane, a worm-driven roller at the end of the bed, for working out the contents, and a toothed drum, just above the roller, for breaking up the fertilizer as it leaves. All these appliances are operated by gearing from the truck motor. They are readily removed for ordinary hauling work.

**A Six-Ton Truck Equipped with a Spreading Roller, a Loading Crane, and a Toothed Drum for Breaking Up the Fertilizer, All Operated by the Propelling Motor: They can be Removed When the Truck is Used for Ordinary Hauling**

## GERMANS PRINT PROPAGANDA IN VOLUME OF HOMER

With the end of the war have come many revelations of the unusual methods used by the Germans to spread their harmful propaganda in the countries arrayed against the central powers, and of the clever work which often frustrated their well-laid plans. In one case, what appeared to be an old and worn copy of the works of Homer proved to be a volume of attacks on British rule in India. Only the first few pages of the book were printed with the words of the ancient poet. The remainder, though in Greek type like the beginning, was filled with the diatribe. The volume was addressed to an educated Hindu capable of translating the Greek into an Indian dialect.

## NEW ASSAY-OFFICE VAULTS LARGEST IN WORLD

In the underground vaults of the new United States assay office, the cornerstone of which was laid recently in New York, can be stored more than $20,000,000,000 in gold. They are said to be the largest and finest in the world. Five of the eight stories of the building will be located beneath the surface of the earth. Sealed in the cornerstone of the structure are copies of several newspapers; a medal on which there is a portrait of the president, and a bag containing a set of United States coins, ranging in value from one cent to $20, besides other articles of interest and value. The building will cost over $800,000. A number of government officials attended the cornerstone-laying ceremony, and were guests at a luncheon given by prominent bankers of the city after the stone had been sealed.

## WHEELED STEPLADDER MOVED BY TURNING A CRANK

When the user of a newly invented stepladder wants to move it along to another spot, he does not have to descend and carry it, and then climb up again. He merely turns a crank at the top with one hand and holds a steering handle with the other, and travels. The four legs of the ladder are equipped with small wheels. One of those at the rear is connected by chain or belt to a pulley or sprocket on the crank axle, while the two forward ones are pivoted and connected to the steering rod.

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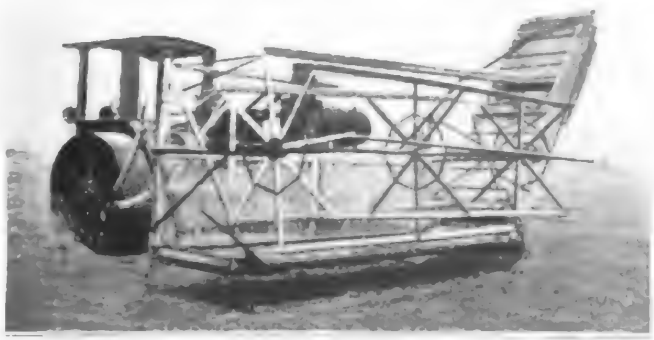
**Invented by a Kansas Farmer, the Elevator Pictured Here Carries Wheat Heads to the Top of a Stack as Rapidly as They are Thrown from the Wagon to the Receiving Platform of the Machine**

# TRACTOR-OPERATED HARVESTING MACHINES

HARVESTING the enormous wheat crops of Kansas and Nebraska is a task of such proportions as to be almost impossible of accomplishment without the aid of the tractor. The farmers of the states no longer consider the machine a doubtful substitute for horses, but regard it as an absolute necessity in the fields. Many of them have applied their experience with the tractor to developing new methods of using it, and their



**Combination of a 12-Foot Header and a Powerful Tractor: The Harvesting Machine is Driven by a Chain from a Sprocket on One of the Drivewheels of the Tractor**

**Fastened behind an Ordinary Binder, This Two-Wheeled Tractor Supports the Rear of the Machine and Steers It across the Wheat Fields. One Man Controls the Mechanism**

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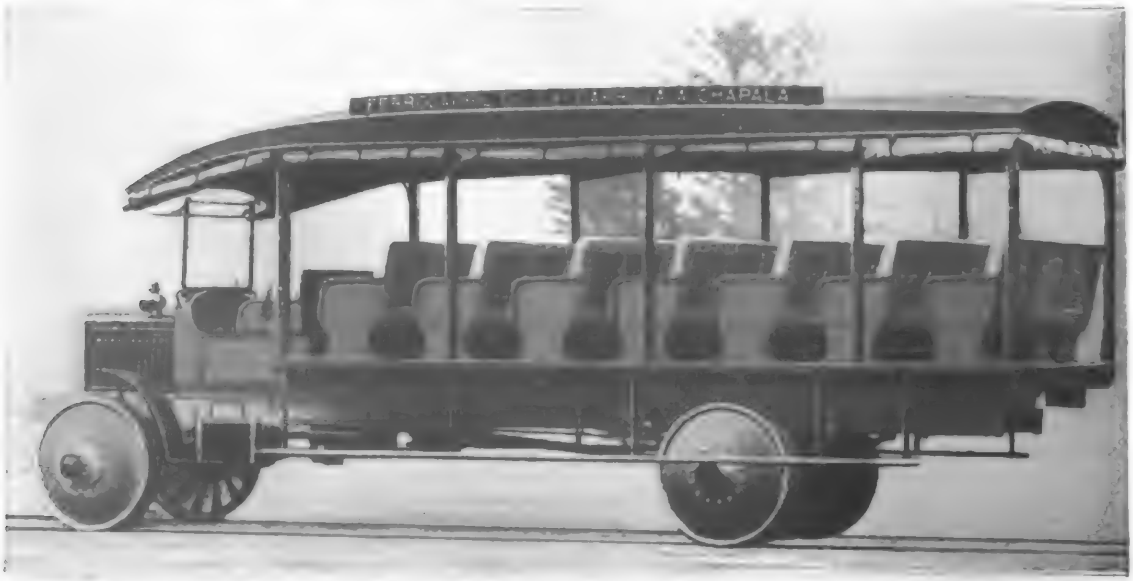
Scene in One of the Great Wheat Fields of the Middle West, Showing a Combined Tractor and Harvesting Machine at Work. The Latter is Loading the Grain into a Wagon Which Travels Alongside

ideas in a number of cases have proved to be valuable. Among the recent improvements brought about in this manner are combined tractors and headers, the latter being the giant harvesting machines used where wheat acreage is large. One of these combinations is a 12-ft. header, attached to the front of the frame of a powerful tractor, and driven by a chain from a sprocket on the left drivewheel of the latter. In another, a two-wheeled tractor forms the rear support of an ordinary binder, and not only pushes the havesting machine, but steers it as well.

Many headers and binders are now manufactured for attachment in front of standard tractors. Another invention that has been found useful in the wheat belt is the wheat-head elevator recently devised by a Kansas farmer. In this the grain is carried in a trough to the top of a stack by a crossbar conveyor operated by a gasoline engine. The receiving platform of the elevator is at such a height as to make the work of transferring wheat heads from wagons to the elevator an easy matter.

## HEAVY PASSENGER TRUCK RUNS ON NARROW-GAUGE RAILWAY

South American railway gauges are far from standardized, varying from 5½ ft. down to the contracted arrangements universally classed as "narrow gauge." On the order of one of the latter systems, a Wisconsin motor-truck builder has just turned out a special five-ton chassis, equipped with flanged steel wheels. A platform body with permanent top has seven seats besides the driver's, accommodating 21 passengers. The car is wholly without steering mechanism. The sides are equipped with running boards.



Five-Ton Truck with Flanged Steel Wheels, Specially Designed to Run on Narrow-Gauge South American Railways: No Steering Mechanism is Provided. The Car Accommodates 21 Passengers

## CORPORAL'S WAR SOUVENIR SIGNED BY GENERALS

Military regulations place many obstacles in the way of enlisted men who desire to obtain favors from commissioned officers of high rank. In spite of this, a Denver corporal, recently returned from service in France, brought with him a souvenir on which are written the names of 78 generals of the American and allied armies. The autographed memento is a white-silk scarf on which are sewed small flags of the countries that fought the central powers. Among the signatures which appear on the cloth are those of General Pershing, General Pétain, General Dickman, and Secretary of War Baker. The corporal used some interesting methods in acquiring the collection.

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¶Aren fiber, obtained from a palm of the same name in the Dutch East Indies, is said to be suitable for covering submarine cables. It is used by natives of the islands for rope making and thatching.

## CHEESECLOTH TANK BUILT TO FOOL ALLIED AIRMEN

Some overworked German camoufleur probably received an iron cross for contriving the fake tank shown in the photograph. It was found by advancing Americans in the St. Mihiel salient, bristling with stovepipe artillery, and covered wth cheesecloth armor. Mounted on a wagon, the mosquito-proof structure could be moved about at will behind the lines. It was built to fool allied aerial observers, which it may have done with great success.

PHOTO BY FRANK P. SIBLEY

**Imitation Tank Left by Retreating Germans in the St. Mihiel Salient, to Misguide Aerial Observers: With Its Stovepipe Artillery and Cheesecloth Armor It Probably Looked Very Formidable from the Air**

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## NOON-HOUR BAND CONCERTS FOR SHIPYARD WORKERS

Encouraged by their employers, who believe that music furnishes inspiration for better work, skilled laborers in a Pacific-coast shipyard have formed a 30-piece band which entertains an appreciative audience of shipbuilders every day at the noon hour. The musicians are led by a fellow workman, who, like the remainder of the organization, appears at the concerts in his working clothes. So enthusiastic are the bandsmen that often they do not stop to remove the grime of toil from their hands and faces before taking up their instruments. Increased efficiency has been noted in the shipyard force since the entertainments were started.

**Though Not Nattily Attired, This Band, Composed of 30 Skilled Laborers, Inspires Workmen in a Pacific-Coast Shipyard to Greater Efficiency by Playing Every Day at the Noon Hour. Their Efforts are Encouraged by the Owners of the Plant**

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BELGIAN MARTYRS HONORED WITH PUBLIC FUNERAL

BELGIUM will not soon forget the ruthless cruelty of German occupation. Bodies of citizens, shot by the Germans for alleged offenses, were recently disinterred at Brussels and honored with a solemn public funeral. Guarded by the military, they lay in state on the steps of the ancient city hall, where thousands passed before them in silent tribute to their martyrdom. King Albert was present at the memorial services. Although the Belgian capital suffered less than most of the ravaged cities, proofs of the Hun's nauseating brutality were not lacking. Here fell Edith Cavell, whose body was exhumed several weeks ago for triumphant return to England and an interment befitting her heroic end.

## PEACE MEDAL COMMEMORATES TREATY OF VERSAILLES

A peace medal of exceptional beauty and significance of design has just been struck off by an American society of numismatists. The design was selected by a committee from 15 submitted by prominent sculptors, and is the work of a young American artist. The obverse bears the figures of Peace, with palm branch and wreath; Justice, still helmeted but with sheathed sword, and between them the Pegasus-mounted form of Righteousness in a league of nations. The reverse bears, within a wreath, the palace of Versailles and the sun breaking through the clouds of war. The inscription reads "Peace of Versailles, 1919," and the name of the society. The medals are in silver, for members only; and in bronze, for general distribution.

Commemorating the Signing of Peace at Versailles. This Medal was Designed by a Young American Artist for the American Society of Numismatists

¶Several solders for use with aluminum have been produced in Switzerland, as a result of the increased use of this metal in place of copper, which is still scarce. One of these has a melting temperature of 632° F., while others melt at 438° F., 560° F., and 531.2°, respectively. Perfect union of aluminum pieces is obtained by their use, it is said. The materials were discovered after many experiments.

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**Scene on Scapa Flow, the Great Naval Basin in the Orkney Islands, Shortly After the Interned German Fleet had been Scuttled by Its Crews: The Destroyer in the Foreground is Resting upon a Sunken German Ship and was Thereby Saved from the Fate of the Others**

## SINKING OF GERMAN WARSHIPS GREATEST SCUTTLING FEAT

When the German crews left in charge of the surrendered fleet, interned among the Orkney Isles, succeeded, on June 22, in sinking eight battleships, five battle cruisers, five light cruisers, and 28 destroyers, besides beaching and damaging a number of others, they accomplished the greatest feat of scuttling in history. Under the very guns of the guard ships, whose officers apparently had not yet realized the depths of Hun treachery, the sea cocks of the interned ships were opened, and the fleet, flying the German flag, sank slowly in the Scapa's depths. Some 5,000 members of the crews were all either captured, or—in a few cases—shot when they failed to surrender. It is stated that the sunken ships will form, unless salvaged at great expense, a serious impediment to the further use of Great Britain's naval base on Scapa Flow.

## HUMAN BODY FORMS CUSHION FOR FALLING WORKMAN

A human body acted as a cushion to save from serious injury or death one of two building washers who fell 40 ft. from a suspended scaffold in a western city recently. The accident occurred while the men were working at the third story of an office building. A chafed rope parted, releasing one end of the platform, and the pair plunged to the concrete sidewalk below, the man who had been sitting nearest the end of the scaffold striking the hard surface first. His injuries were such that he died almost instantly, but his companion, who alighted on top of him, was only slightly hurt. Though the sidewalk was crowded at the time of the tragedy, no pedestrian was injured.

**One Man was Killed by Falling from a Suspended Scaffold When a Rope Broke. His Companion Escaped Serious Injury by Falling on Top of Him**

## LIGHT MILITARY RAILROADS SUITABLE FOR BRANCHES

Portable railroads, such as were used in the war, have been suggested as suitable for branch lines from regulation tracks into sparsely settled regions, where more costly construction could not be made to pay, and for paralleling improved highways to care for such freight as cannot be carried conveniently in trucks. In the latter case, the tracks could be laid be-

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fore the highway was improved and used for hauling material necessary for that work. To develop the plan to its fullest extent would mean building feeder lines from the railroads of today to every mine and farm in the country. The tracks are light, can be laid quickly, and require little roadbed.

## SHORTENING FIRE TUG SAVES ENGINEER'S SALARY

By shortening a fire tug approximately 3½ in., the municipal authorities of a Pacific coast city considerably lowered

Shortening This Fire Tug Three and One-Half Inches by Planing Off the Craft's Cutwater Saved a Western-Coast City a Second Engineer's Salary

the cost of operating the vessel. Under the law, a boat of this type, which is over 65 ft. in length, is required to carry two engineers. As salary provision had been made by the city for but one engineer, there was more than a little consternation when it was discovered that the builders of the tug had completed it with a length of 65 ft. 3½ in. After a careful examination of the craft, it was learned that the offending 3½ in. could be removed from the cutwater without affecting the lines or efficiency of the boat. One engineer travels on the shortened tug, while the salary of a second remains in the city treasury.

## DIRIGIBLE BLOWN HELPLESSLY ABOUT NORTH ATLANTIC

A tale of hair-raising adventure in the busy days of July, 1918, has just been disclosed by officials of the Navy Department. The story is about two ensigns and a machinist's mate who put to sea from Chatham, Mass., in the nonrigid dirigible "B-12" under orders to hunt for German submarines, then lurking in our coastal waters. In their car was a heavy cargo of bombs, but little food and less water. In attempting to escort a transport in mid-afternoon the rudder broke. A sea anchor was thrown overboard, but the towline parted, and the craft was at the mercy of the stiff north wind. At 8:30 p. m. a gasoline pipe snapped, emptying the tanks and so lightening the craft that it soared to 3,000 ft. At that level it was blown northward all through the night, all next day, and all the following night. Food and drinking water were gone. On the morning of the third day the worn crew decided to take a desperate chance at rescue, so brought the bag to the water. Luck was with them. A steamer picked them up, more than 300 miles from their starting point.

## REVOLVING GARDEN SHELTER PLACED ON MARKET

While the idea of a revolving shelter is not a new one, it was not commercialized until recently, when an English firm placed on the market several different designs and sizes of these houses. Placed on a base that permits the entrance to be turned toward the sun on bright days, away from the wind or rain on other days, the shelter is recommended for health as well as pleasure.

This Revolving Shelter is Recommended for Fresh-Air Treatment of Tubercular and Nervous Patients

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Two of the Concrete Ships to be Used by the British Admiralty in Salvaging Craft Sunk by Submarines during the War are Shown in This Picture. Submerged Alongside a Wreck, They are Expected to Float the Sunken Vessel, When They are Pumped Out and Rise to the Surface

## UNUSUAL CONCRETE SHIPS BUILT FOR SALVAGING

Concrete ships of extraordinary design are being built for the British Admiralty to be used in raising merchant vessels sunk by the Germans near the coast of the United Kingdom. On a broad foundation, shaped like the hull of a ship, are placed a series of towers, constructed of hollow blocks, and reinforced in such a manner as to be able to withstand great internal pressure. The towers are provided with water-tight doors and pumps. These unusual vessels are to be towed to the location of a sunken ship, and lowered on either side of the wreck. Divers will then attach them to the wreck. When they are pumped out, they are expected to rise to the surface, carrying the wreck with them. Their cost is in the neighborhood of $5,000,000 each. German war vessels sunk by their Teuton crews in Scapa Flow may also be reclaimed by the use of these salvaging ships.

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¶ The air service of both army and navy have adopted a new distinguishing insigne for air craft, formed of a red circle inside of a white star, surrounded by a blue circle.

## LIGHTLESS AUTO BUS IS RUN ON FROZEN ALASKA TRAILS

When the people of Anchorage, Alaska, recently awakened to the fact that the city had outgrown the dog-sled stage, and needed modern transportation, the problem looked difficult. Arctic trails have not yet joined the good-roads movement. Local business men were convinced, however, that a good auto could handle the situation. They ordered a motor truck, with a body fitted to carry 16 passengers and their baggage. So, now, at all hours of the 24, the ultramodern vehicle may be seen moving rapidly and surely along the paths formerly given over to the malemute and his sled. The bus carries no lights.

This Auto Bus Is Peculiar, in That It Has No Lights. The Car Works 24 Hours a Day Carrying Passengers over Alaska Trails

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## MACHINE DRILLS BIG SHIP TIMBERS AT ANY ANGLE

A huge protractor, forming part of a drilling machine installed at a western shipyard, solves the problem of boring holes at various angles in heavy ship timbers. The power-driven auger is mounted on the rim of the protractor, which is supported by rollers and turned with a handwheel. The timbers, brought to the machine on a wheeled carriage, are fed by power rollers directly through the big circular scale, which is adjusted to any desired angle. The machine is stated to accomplish 50 times the work of the old hand auger.

Drill Mounted on Huge Protractor, Which is Turned at Any Angle Desired by the Handwheel at the Right, While Power-Driven Rollers Feed the Work to the Auger

## PURIFIED SEWAGE WATER USED IN BRITISH MILLS

The urgent need of additional water supply has induced the authorities of Sheffield, England's busy steel center, to sanction an innovation in water engineering. In the past, several million gallons of fresh water from the city's reservoirs have been turned into the local streams daily to compensate the owners of mills along the river banks for water taken by the city waterworks. Under the new scheme purified sewage water is to do this work, releasing the virgin supply for other purposes. The novel project is believed to be attended by certain dangers, but is judged to be worth a thorough trial.

## THREE-MILE TRAIN OF TRUCKS WINDING ACROSS CONTINENT

Individual car owners still consider it quite a feat to cross the continent, even with good hotel accommodations every night. Yet the 3,000-mile run is now being negotiated by an extraordinary train of military trucks, that stretches out over three miles of Lincoln Highway. Standard army trucks, ambulances, kitchens, anti-aircraft wagons, and searchlight carriers, to the total of 60, make up the big train. The schedule specifies not less than 75 miles a day, at about 15 miles an hour, and the crew of 200 or more men and officers will live wholly in the vehicles for the entire trip. Its purpose is to recruit for the Army Motor Transport Corps, and to demonstrate the country's need of an extensive system of military roads and heavy bridges.

## CADDIES' GOLF-BALL TRADE STOPPED BY SIGN

Resentful grimaces doubtless are made by Filipino caddies when they pass a certain sign on a golf course near Manila, as it seriously interferes with their traffic in golf balls, once a source of considerable revenue. The sign warns players not to purchase balls from the youthful attendants, intimating that the practice causes the boys to search less diligently for lost spheres, and requests that caddies offering balls for sale be reported.

Filipino Caddies on a Golf Course near Manila Dislike This Sign for Obvious Reasons

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LOS ANGELES PARADES "ACE OF ACES" IN FLORAL AIRPLANE

A FLORAL airplane was a clever feature of the homecoming celebration with which Los Angeles honored Eddie Rickenbacher, America's "Ace of Aces." More than 100,000 blossoms are said to have been used in covering this replica of his fighting "Spad." The famous "Hat-in-the-Ring" insigne was not forgotten. Behind the float followed a procession two miles long. At the final reception in Rickenbacher's honor he was presented with an unusual diamond ring, the great stone in the center being surrounded by four aces, and the whole inclosed by 26 stars, one for each German opponent vanquished.

## SWEDISH STEAMSHIP CAPTAIN DISSECTS FLOATING MINE

Floating mines set adrift by the Germans during the war still menace shipping on the Baltic Sea. Though dodging these instruments of destruction has become almost a habit with commanders of vessels navigating the northern waters, the captain of a Swedish steamship that recently reached the United States after a voyage from Gothenberg, Sweden, not only stopped to pick up one of the dangerous contrivances, but dissected it on the deck of the steamer. The high explosive in the mine, 300 lb. of it, was dumped overboard by the curious officer, and the shell was delivered to the British naval authorities.

¶ Electrification of the suburban railroads of Berlin has begun, in spite of the post-war conditions in Germany. Coaches on hand will be converted for use under the new system. When traffic is light it will be possible to divide the standard trains of 12 coaches into two trains of six coaches each, as the larger trains are driven by motors at either end.

## VENTILATED FRUIT CLOSET UTILIZES WASTE SPACE

Canned fruit and other foodstuffs requiring coolness and darkness for preservation are kept by an Ohio woman in a ventilated closet, which cost little to construct, and which occupies space formerly wasted. The closet was built over the refrigerator, which stands in a narrow pantry, and is provided with double doors. Ventilation was obtained by connecting the compartment with an unused chimney, which allows cool air to enter. In use the closet has proved to be as satisfactory as a cellar, except in extremely cold weather, when the temperature inside of it sometimes falls to the freezing point.

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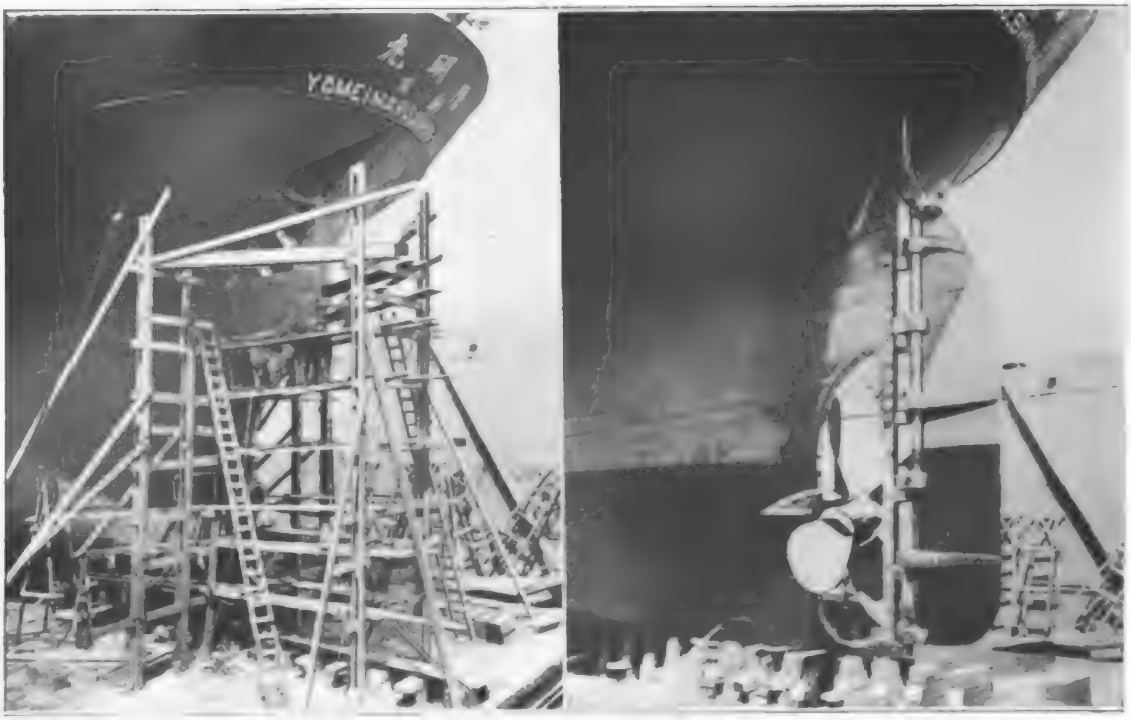
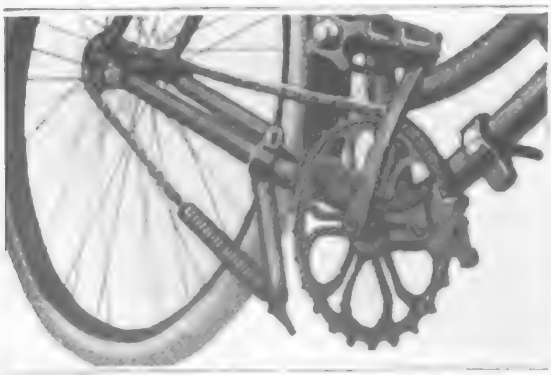


Considerable Interest has been Aroused by the Speed of the Repairs Made Recently on the Japanese Liner "Yomei Maru." Rudder and Rudder Post had to be Replaced, a Difficult Task, as may be Judged from the Photograph at the Left. Numerous Heavy Plates and Hundreds of Rivets First had to be Removed. The 32-Foot Rudder Was in Place, as Shown at the Right, in Less Than Half the Expected Time

## BROKEN CHAIN ADAPTS BICYCLE TO ONE-LEGGED RIDERS

From France, the home of innumerable crippled war veterans, comes an ingenious arrangement by which the bicycle is adapted to the one-legged rider. The chain is cut, one end being secured to the pedal sprocket, the other to a coil spring from the lower frame. The usual rotary motion of the pedal, so difficult for the one-legged person to maintain, is thus transformed into an up-and-down movement. A rubber check on the frame arrests the pedal in the upright position at the end of the pullback by the spring.



BY COURTESY OF LA NATURE

This Pedal Arrangement with Up-and-Down Motion is Designed for the One-Legged Bicycle Rider

## PACIFIC SHIPYARD HANGS UP NOTABLE REPAIR RECORD

The steamship "Yomei Maru" recently limped into Puget Sound with its 32-ft. rudder and rudder post missing, torn away by a riotous Pacific storm. The job of replacing the lost parts would ordinarily have taken six weeks, as it involved the tedious task of cutting rivets and removing stern plates even before the actual replacement could be begun. But the shipyard which obtained the contract went after a record. Three crews of specialists completed the work in two weeks and five days, saving the owners of the "Yomei Maru" something like $40,000 in time otherwise lost. The record-breaking performance has brought inquiries from marine experts in all sections of the country.

## SECTIONAL DITCH BOTTOM MADE OF CONCRETE

Intended to form a solid bottom for an open drainage ditch, portable concrete sections, designed by a Panama Canal sanitary inspector, have been giving satisfactory service for over a year in the Canal Zone. Each section is 30 in. long by 10 in. wide, and shaped like half of a tile split

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longitudinally. Bell joints unite the sections, which are firmly fastened together by concrete poured at the joints of the union. While the sections are being leveled and the binding concrete is hardening, they are held together by steel pins inserted at the joints.

## PLAN TO USE BATTLE FIELDS FOR GRAZING SHEEP

Sheep will be grazed on the former battle fields of Europe until such time as the war-swept regions are suitable for farming operations. At present the devastated portions of France and Belgium are covered with a luxuriant growth of grass, providing excellent sheep ranges. Plans are being made by agricultural relief organizations to donate flocks of British sheep to farmers who wish to return to their holdings in such localities.

## MIDGET MONOPLANES SELL AT POPULAR PRICE

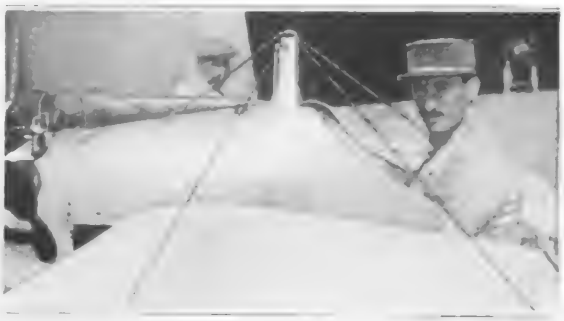
A reputable French firm is now offering the "Mosquito," a vest-pocket, single-seater monoplane, for $800. The wing span is only 13 ft. A horizontally opposed, twin-cylinder engine of 20 hp. is said to give it a speed of over 60 miles an hour. The pilot of the big "Goliath" machine, which travels weekly from Paris to Brussels, recently rose in the dainty little plane to a height of nearly 5,000 ft. On returning to the landing field he dramatically proved the lightness of the machine by taking the tail over his shoulder and dragging it to the hangar.

## PACKING CASES FOR EUROPE BECOME KITCHEN CABINETS

An interesting bit of practical ingenuity will play its part in the reconstruction work of the Methodist Missionary Cen-

Supplies Sent by an American Relief Organization to Europe will be Shipped in Cases Easily Converted into Kitchen Cabinets

tenary, the hundred-million-dollar enterprise by which that church is celebrating the hundredth anniversary of its missionary activity. It has been decided that all supplies sent by the centenary to



This Is a Little French Craft Called the "Mosquito," and Claimed to Be the Smallest Practical Airplane in the World, Its Wing Span Being Only 13 Feet. Above Is a Closer View of the Fuselage

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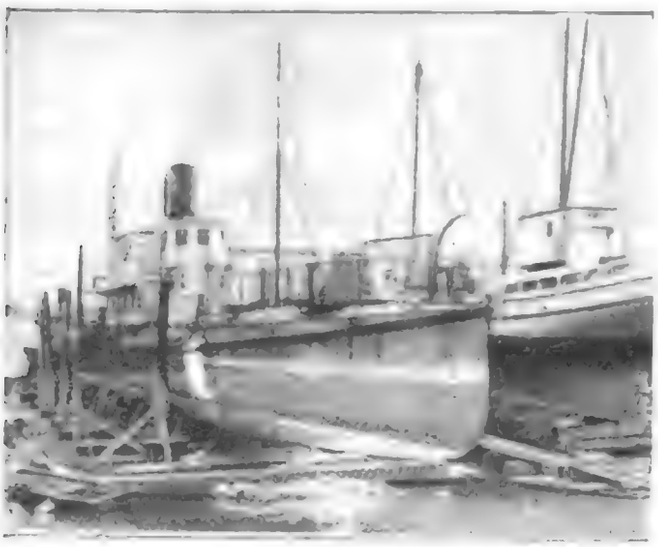
the devastated areas of Europe will be shipped in transformable packing cases. Each case is of heavy construction, with a two-piece top which is pried off intact. This top is converted into two swinging doors by sawing through the crosspieces, and applying the hinges which are found inside. Three shelves are packed in each case, with cleats to hold them already nailed in place. A paintbrush and a can of mahogany stain are also included, enabling the recipient to change the case into a serviceable kitchen cabinet with no expense and a minimum of effort.

## TORPEDO BOAT TRANSFORMED INTO HALIBUT TRAWLER

Obsolete as a vessel of war, the remodeled torpedo boat "Fox," which played



**As a Fighting Vessel the Torpedo Boat "Fox" Helped Put down the Boxer Rebellion; Remodeled, It will Become a Halibut Trawler**

a part in quelling the Boxer rebellion, in China, will soon leave Seattle, Wash., to ride the waves of the Pacific Ocean as a halibut trawler. Numerous changes are being made to fit the ship for its new purpose. Engines of late model have been installed in the trim steel hull, a peaceful-looking stack has replaced the rakish funnel of the fighting craft, and a new house has been built amidships. All of the equipment peculiar to a war vessel will be removed. The "Fox" was built in Portland, Ore., in 1899.

## DANUBE RIVER MOTORBOAT OF SPECIAL DESIGN

Designed to overcome navigation difficulties peculiar to the Danube River, a motorboat of special construction was tested recently on that stream and found to be satisfactory. Below the water line the craft is a combination of the V-shaped and gliding-type boats, and as it draws only 1½ ft. of water, it is able to pass through shallow parts of the river. The boat is slightly over 26 ft. long, and about 5 ft. wide. It is propelled by a four-cylinder gasoline engine which develops 32 hp. Running with the current, it has a speed of 28½ miles per hour, while it travels 20 miles per hour in the opposite direction.

## MAGNETIZED POWER PULLEYS PREVENT BELT SLIPPING

Magnetized pulleys for the transmission of power through thin iron or steel belts have been patented in France. Because of the attractive force of the wheels, the belts adhere tightly to them, and no power is lost through slipping. Windings in spiral slots on the surface of the pulleys are the source of the magnetism. Tests of the new system have shown it to be efficient, and especially suitable for use with high-speed turbines.

# HUGE CONCRETED PIPE RAILROADED TO RIVER BED

An engineering feat of doubly unusual character was performed in the recent laying of a section of the Jersey City, N. J., water-pipe line. In its course to that city from Boonton, the pipe crosses the Passaic River at Nutley, the submerged portion being 500 ft. long and weighing about 1,000 tons. It consists of a 6-ft. steel tube incased in heavy reinforcing wire, and coated with cement-and-sand concrete, 4 in. thick, applied with a cement gun in the fashion employed in concrete-ship building. Two narrow-gauge railroad lines were laid on trestles across the river, with space between them for the pipe; and the supporting cradles were built on wheels resting on the rails. When the pipe section was finished, after three months' work, the whole structure was rolled to a position above the river. Then, by careful unwinding of the supporting cables, aided by mounting spirit levels in the center and 50 ft. from each end, the big pipe was lowered to the river bed without a hitch.

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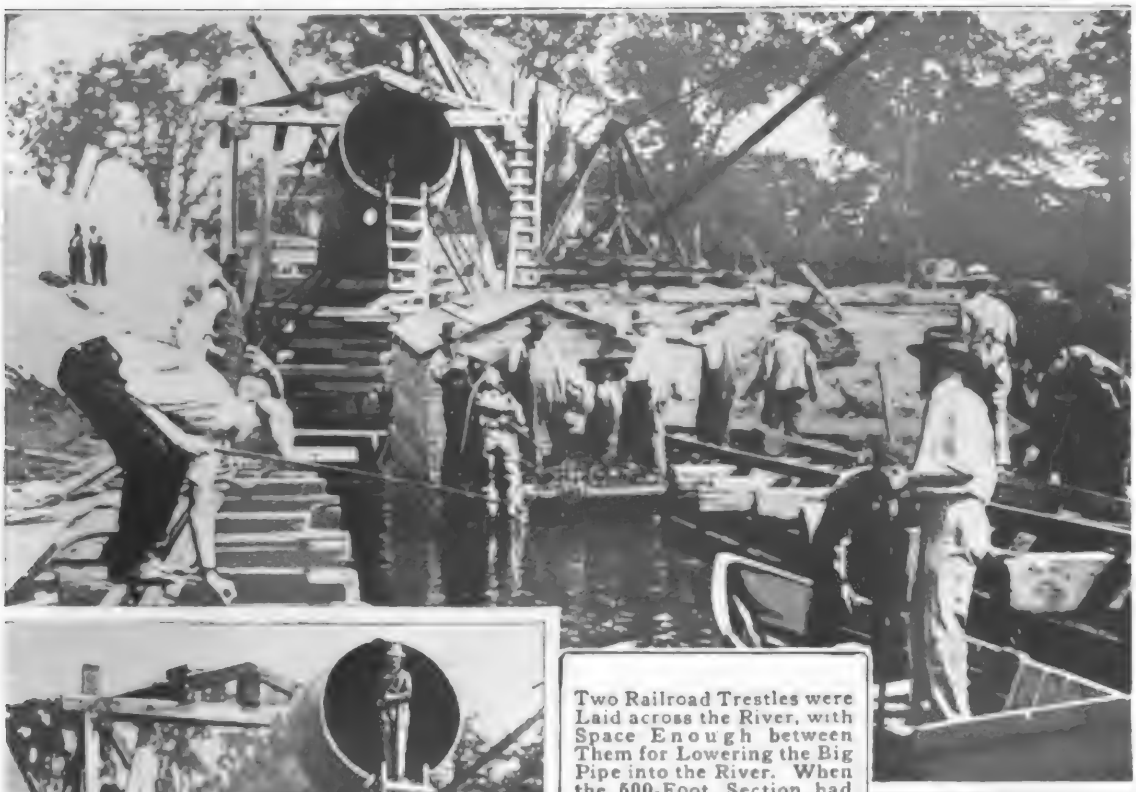
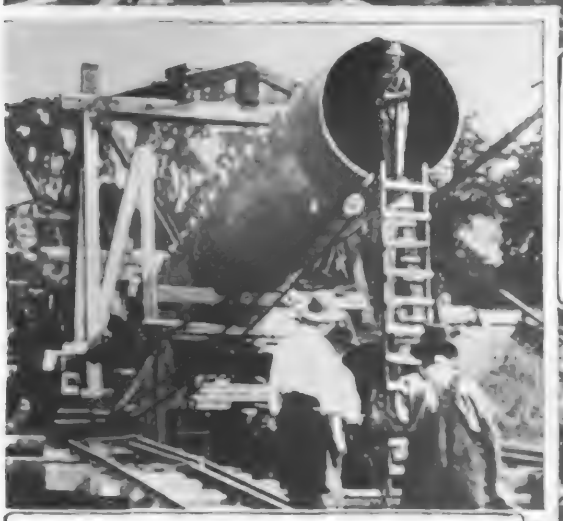


Two Railroad Trestles were Laid across the River, with Space Enough between Them for Lowering the Big Pipe into the River. When the 500-Foot Section had been Coated with Concrete, It was Moved across the Stream, Supporting Cradles and All, and Sunk



Close-Up View of the Cradle Construction: The Big Pipe Rested in Cradles Hung from Heavy Uprights, Which Stood, in Turn, on Small Railroad Trucks

The Huge Steel Pipe, Six Feet in Diameter, was Coated with Concrete Four Inches Thick, Applied with a Cement Gun over Heavy Wire Reinforcement. The Gun Was of the Type Usually Employed in Concrete Ship Construction



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## CAUTIOUS DRIVING URGED BY SIGNS ON CARS

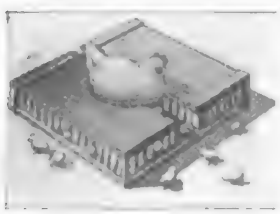
A successful campaign against careless automobile driving is being conducted by a motorists' club of Seattle, Wash. Not

Reckless Automobile Driving is Discouraged in Seattle, Washington, by Polite Suggestions Carried at the Rear of Cars Belonging to Members of a Motorists' Club

only do the members of the organization report to the police all violations of traffic regulations noticed by them, but they carry reminders of the need for caution with them on their cars. A metal plate fastened below the license-number tag bears the proposal, "Let's Drive Carefully," in letters large enough to be read by the driver of a car some distance behind. As the club has nearly 1,000 members, it is expected that the movement will produce the desired effect.

## SIMPLE HOVER INCREASES EFFICIENCY OF HENS

A large brood of chickens may be cared for by one hen with a simple, recently patented hover. It consists of a square platform, supported a few inches above a base of similar size by pillars at each corner. In the center of the platform is a hole of the correct size to accommodate a seated hen, with a passage leading to the hole from the edge of the platform. Strips of cloth are suspended from the edges of the platform, hole, and passage.



¶Iron may be rendered rust-proof, it is claimed, by a process recently discovered by a Swiss scientist. Treated while red-hot with superheated steam, the iron receives a hard coating of black iron oxide. If the temperature of the iron is raised to 1,422° F. and the treatment continued for six or seven hours, a harder and more durable coating is obtained.

## SHIPYARD SUCCEEDS IN CUTTING BUILDING COSTS

The Puget Sound Navy Yard has succeeded in reducing appreciably the cost of building ships. From Nov. 24, 1918, to April 24, last, the unit cost of driving rivets was cut in two. On ammunition ship "No. 1," official records show, the labor cost of each rivet driven was 16.5 cents in November. In April it was only eight cents.

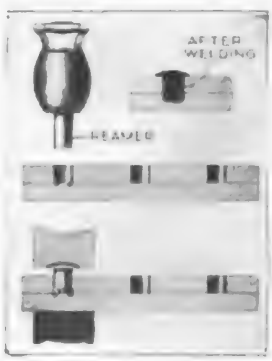
The head of construction at the yard, in commenting on the new records, attributes the result to a careful selection of workmen, with the slow and incompetent weeded out; to the fact that the crews have become experienced and skilled, and, more notably, to the intense loyalty of the yard employes, who are as anxious to stand high in the eyes of Washington as is the commandant himself. The record of rivets driven for five months on the ship mentioned is as follows:

| | Rivets Driven | Labor Cost | Unit Cost |
|---|---|---|---|
| Nov. 24 to Dec. 23 | 107,270 | $17,687 | $.165 |
| Dec. 24 to Jan. 23 | 108,660 | 15,737 | .145 |
| Jan. 24 to Feb. 23 | 131,070 | 16,069 | .123 |
| Feb. 24 to Mch. 23 | 160,495 | 17,069 | .106 |
| Mch. 24 to Apr. 23 | 148,108 | 11,948 | .080 |

The riveting cost on several seagoing tugs constructed at the yard has always been small, ranging as low as six cents, due to the lightness of construction.

## ELECTRIC-WELDING PROCESS JOINS METAL PLATES

A new method of joining metal plates requires rivet holes in but one of the plates, the inserted rivets being welded to the other plate by the electric process. Superimposing the perforated plate upon the other, a tool passed through the holes cuts a circular groove on the surface of the lower plate. A rivet, preferably tapered, is inserted and butted against the projection left within the circular groove; from dies, above and below, a current quickly renders plastic the rivet and projection at the point of restricted contact, so that the application of pressure welds the metal together.

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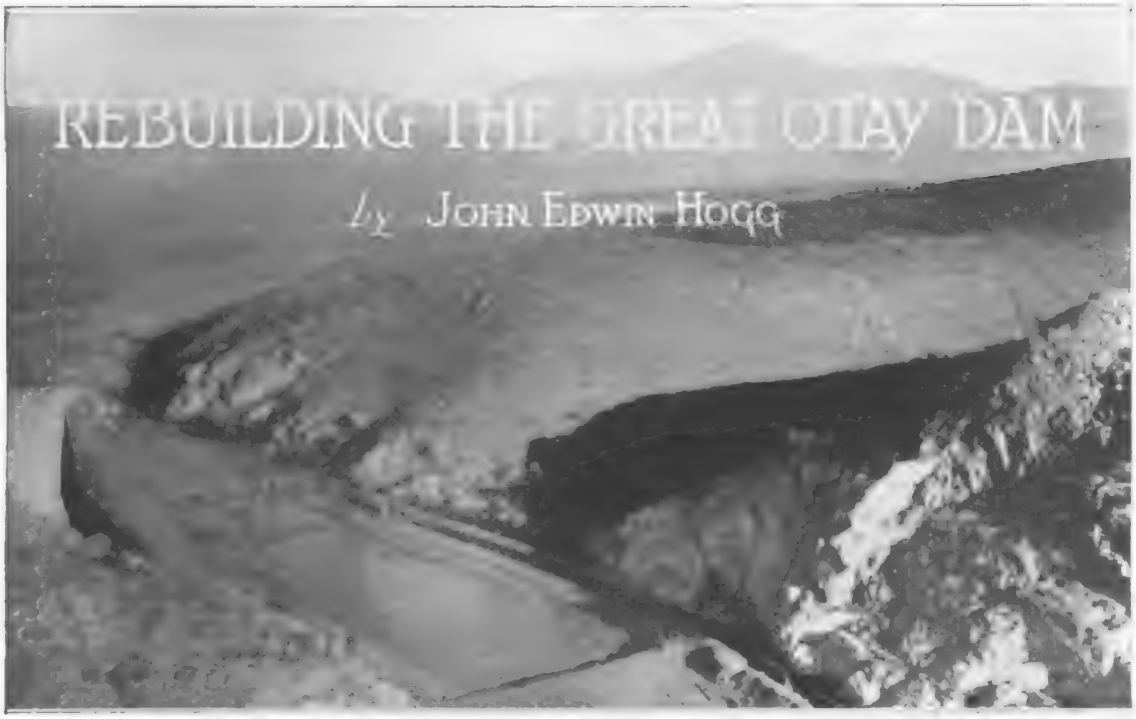
# REBUILDING THE GREAT OTAY DAM

By John Edwin Hogg



**Beginning Excavation Work for the Reconstruction of the Great Otay Dam, Destroyed by Flood in 1916: Portions of the Abutments of the Old Dam Still Are Visible. At the Foot of the Tall Mountain in the Distance Lies the Upper Otay Reservoir**

WHEN the city of San Diego, Calif., in 1897, erected the Otay Dam across the narrow cañon outlet of the Otay Valley as a means of supplying the city with an abundance of water during the arid season of the year, the world looked upon it as a masterpiece of engineering construction. Not only did this dam take care of the city's requirements, but it made possible the cultivation of some 30,000 acres of formerly undeveloped land. The original dam was 500 ft. long, and 150 ft. high. It was of stone and concrete with a sheet-steel core. In January, 1916, rain fell in the Otay watershed at the rate of half an inch an hour for 48 consecutive hours without a stop. By this time, the Otay spillway was discharging 32,000 cu. ft. per second with the water in the reservoir continuing to rise. Then the dam burst.

**The Impounded Waters of the Otay Valley will Form a Lake Six Times as Large as This When the Dam is Completed. At the Right may be Seen the Auxiliary Spillway, Provided to Take Care of Flood Water**



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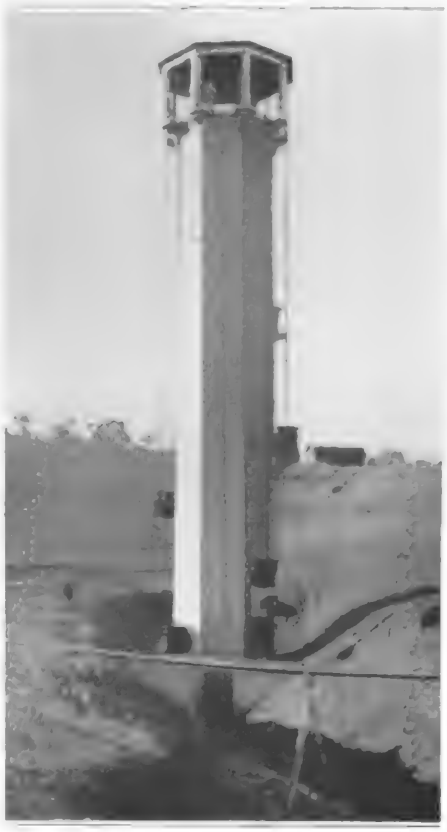
A wall of water, 75 ft. high, went down the cañon, inundating the lowlands and inflicting appalling loss of life and property.

The city thus found itself without water, and the owners of the farm lands, already financially ruined by the flood, faced the prospect of being unable to produce a crop for the coming year. Accordingly a bond issue was floated for $750,000, to begin the construction of a new Otay Dam of colossal proportions compared with the one destroyed by the flood. Work on the new dam began in October, 1917, and was temporarily suspended in August, 1918, the suspension being partly due to politics, but also to the difficulty of securing materials and labor during the war. Construction with city forces was authorized in September, 1918, and the work was renewed. This was made possible partly by the fact that 85,000,000 bbl. of cement had been purchased and delivered on the grounds during the early stages of the work.



Intake Tower of the New Reservoir, 80 Feet High and Provided with Seven Intake Pipes at Various Levels: The Flood Water will Reach the Upper Balcony

The new dam, when completed, will be 200 ft. high. It is 150 ft. thick at the base, and 750 ft. long at the top. The foundation goes down to bedrock, which fortunately was close to the surface of the cañon floor, and composed of an exceptionally fine and hard blue rock. The dam is being built of cyclopean masonry, which, when completed, will have a total weight of 170,000 tons, equivalent to a bulk of some 80,000 cu. yd. The reservoir to be formed by the new dam will store 50,000 acre-feet of water, or approximately 16,000,000,000 gal. This quantity, it is anticipated, will be sufficient for all the city's needs and also for irrigation for many years to come. At its present stage, the Otay Dam is 87 per cent completed. Its completion and formal dedication is expected to be accomplished by the beginning of September next.

The finished part of the dam now confines a portion of the 1919 flood waters, the amount being estimated at 650,000,000 gal., which, with the city's other temporary sources of supply, is believed sufficient to last until the next rains. Three hundred men are now working on the dam 24 hours a day, in eight-hour shifts. They are putting in masonry at the rate of 275 cu. yd. per day. The total freight hauling necessary to complete the dam is only about 25,000 tons, due to the fact that the supply of fine rock from which the dam is being largely constructed is locally available by blasting down the walls of the cañon.

The extraordinary conditions existing at the Otay Dam make the structure distinctly different from any other similar engineering feat ever attempted. It must be taken into consideration that the dam must stand a series of floods which, during about four months of the year, attack it with about ten times the normal rainfall of a watershed of the same size located in the middle West. It is built to stand a strain of discharging 50,000 cu. ft. of water per second, which is 18,000 cu. ft. per second greater than the flood of 1916, the greatest on record. It is obvious that the shedding of this volume of water cannot be accomplished without involving certain engineering difficulties. Chief among these was the problem of getting rid of such a volume without damaging the structure itself. To accomplish this, flanges of masonry, 15 ft. long have been built at the mouths of the spillways. These are designed to direct the flow away from the abutments and walls, sending it in a straight line down the cañon. While the bedrock on which the dam is built was exceptionally solid, it was nevertheless not without the usual rock seams, and these were considered a possible cause of trouble, once the terrific pressure of the water began working on them. So, to

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Some Idea of the Extraordinary Strength of the New Dam may be Gained from This Picture. The Gate Spillways are Provided with Flanges Calculated to Direct the Flow of Flood Water Straight down the Center of the Cañon, and Away from the Abutments of the Dam

The Little Town Visible Here Is the Colony of Workmen Engaged on the Construction of the New Dam. Provisions are Supplied at Cost, a Theater Provides Entertainment, and the Children Have a School, While Sanitation and Safety are Promoted in Every Way

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The Upper Otay Dam, Which Withstood the 1916 Flood, Impounds Some 20,000 Acre-Feet of Water Five Miles above the New Dam; but Even if It should Break, It is Calculated That the Lower Dam, with Its Great Strength, would Hold the Flood without Difficulty



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prepare against this danger, holes were drilled into the rock seams to a depth of 20 ft. Two-inch perforated pipes were then inserted in the holes, and liquid cement was forced into the pipes at a pressure of 250 lb. per square inch. This process was continued until every seam was thoroughly sealed.

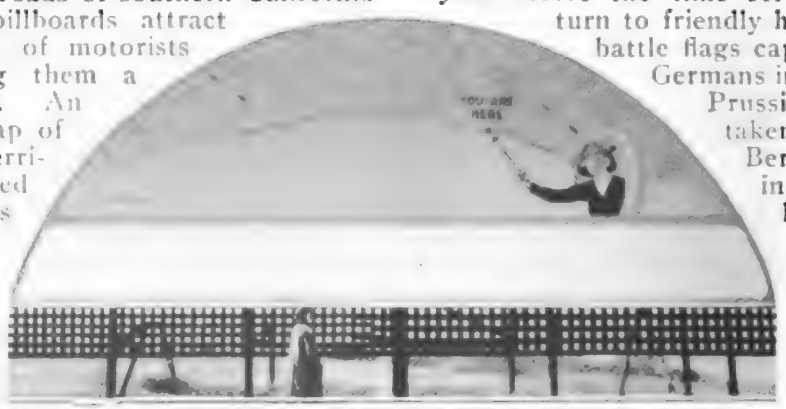
An interesting feature in the construction of the Otay Dam is the cable tramway above it which is used for the hoisting and transporting of materials. This cable way carries building materials of all sorts, five tons at a time and very quickly. It is also used for moving the numerous derricks used on the job to various points where they are needed. These derricks weigh 28 tons each, yet by the overhead cable hoist they are moved from one side of the dam to the other, to the top of it, or onto the cañon floor. The average time consumed in moving one is 10 minutes. To move one by the usual methods would require a week.

Thus far no employe has been killed during the work, owing, no doubt, to the adoption of effective safety measures. Thus all rocks and material used in the construction are hoisted in skips instead of in chains—the usual practice; employes are penalized for carelessness that might cause accidents, and classes in safety engineering are held once a week. The Otay Dam, located 22 miles east of San Diego and about 12 miles north of the Mexican boundary, is only 400 ft. above the level of the city. This fact, coupled with the irregularity of the water flow, eliminates the possibility of developing hydroelectric power.

Living conditions among the men of the dam camp are ideal, and sanitation is excellent. Temporary houses have been erected to care for their home life. Men who are married or have families live in houses by themselves, and are supplied with provisions and supplies from the camp commissary on the basis of cost. Single men live in the camp dormitory, which is arranged like a big hotel, and board at a camp mess hall very similar to that of the average army camp. These men are boarded on the basis of actual cost, and each one receives that amount over and above his wages. A school is maintained for the children, and there are elaborate entertainment features for the men and their families. There is a motion-picture theater, and once each week a vaudeville performance is given by actors brought out for the occasion. There are also two churches where Sunday services are held, one Catholic and one Protestant.

## BILLBOARDS MAP LOCALITY FOR MOTORISTS

Along the roads of southern California advertising billboards attract the attention of motorists by rendering them a real service. An enormous map of the local territory is carried and Miss "Lotta Miles" points out one's exact position on it. These boards are met with at intervals of a few miles. The visiting motor tourist, to whom local roads are unfamiliar, is likely to entertain a lively sense of gratitude toward the kindly advertiser who combines such useful information with the announcement of his wares.



When the Auto Driver Touring Southern California Roads can Consult One of These Maps on a Wayside Billboard Every Few Miles, He Has Little Excuse for Asking Questions

## GERMAN RIOTERS DESTROY FRENCH BATTLE FLAGS

Just before the time set for their return to friendly hands, French battle flags captured by the Germans in the Franco-Prussian war were taken from the Berlin museum, in which they had been since 1870, and destroyed before the statue of Frederick the Great in Unter den Linden. It was provided in the peace treaty that the flags should be returned to France. A mob led by a German officer seized the flags, which were packed for shipment, and carried them to the statue where they were burned or torn to pieces.

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This Battered Hulk Was Once the Steel Yacht "Mariechen," One of the Handsomest Vessels in the German Merchant Marine. It was Wrecked in the Pacific Several Years Ago, Abandoned, and Finally Washed Ashore in Puget Sound. It is Now being Cut to Pieces with Oxyacetylene Torches and Carried to a City Junk Yard by Auto Truck

## OLD GERMAN YACHT CUT UP AS RUSTY JUNK

An air of almost human tragedy hangs about the stanch old ships which have sailed their last voyage and now forlornly await destruction on some lonely beach. On a mud flat on Puget Sound lies one of these unfortunates. Christened the "Mariechen" by a German princess in Hamburg, 19 years ago, it started its career as a graceful, all-steel private yacht. Then it toiled for years as a humble freighter, to be wrecked at last, abandoned, and washed ashore. And now the last chapter is being written by a junk dealer. Toiling in the depths of the hull when the tide is out, and in the upper works when the tide is high, his workmen are cutting it up with oxyacetylene torches.

## ARTIFICIAL JOINT INVENTED BY SPANISH SURGEON

An artificial joint which is proposed as a substitute for natural articulations that have become stiffened through injury or disease has been invented by a Spanish surgeon. Gold and platinum are used in making the device, which is in principle a ball-and-socket connection. The ball, a solid sphere of metal, is mounted on one of two similar plates, while the socket, a hollow sphere of the same material, is mounted on the other. When these parts are fitted together they form a joint that can be moved freely. On the reverse side of each plate are fastened four arms for bending back over the end of a bone. Wires carried in tunnels in these arms are used to bind the sections in place.

The Wreckers with Their Oxyacetylene Torches Find It No Easy Task to Cut through the Heavy Steel Frames and Bulkheads of the "Mariechen." The Steel Sides are More Easily Salvaged, being Cut into Plates, Each Two Feet by Five Feet

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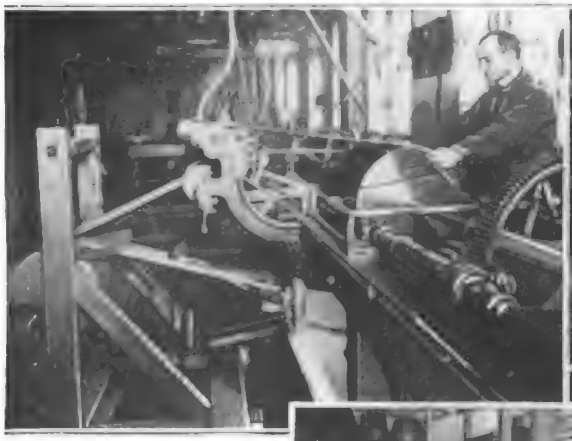
# STRIP OF GUMMED PAPER MAKES STURDY BARREL



The Strip of Gummed Paper is Here being Wound on the Revolving Mold or Core

The Paper Barrel has been Wound and is Now About to be Taken off the Shaping Machine

These Are the Paper Barrels and Tubs as They Come from the Shaping Machine. With the Addition of Wooden Tops and Bottoms They Are Ready for Service

Barrels which are said to be ideal for the transportation of fruits and vegetables are now made from paper. The process is simplicity itself, involving only a strip of gummed paper which is rolled into shape upon a metal core, and completed by the addition of a wooden top and bottom. On the shape of the core depends the form of the barrel, tub, or other receptacle wound upon it by the shaping machine, hence by changing cores the machine may be quickly adapted to the manufacture of any style of barrel. The barrels produced in this way are extremely light, yet surprisingly rigid and durable. They are quite sanitary, too, as the absence of cracks prevents the entrance of dirt and dust during railway travel and prolonged storage.

# MOUNTAIN STATES RAISE BUMPER WHEAT CROP

EVEN the inter-mountain states, not previously marked by exceptional wheat-growing activities, are reporting bumper crops of the great cereal this season. Arizona, Idaho, and Utah particularly are striving to break all their former records, and apparently there is little doubt of their success. There are 32,000 bu. of wheat in the pile in the accompanying picture. All this raw material for the "staff of life" was harvested and sacked on a single farm, near Buhl, Idaho.

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## RADIUM IN SPRING WATER AFFECTS INSTRUMENTS

Radium is present in such quantities in the waters at Bath, England, that delicate scientific apparatus is seriously affected by emanations from the bodies of persons fresh from ablution in the hot springs. The gold leaves of an electroscope in a laboratory there collapsed when a man who had just bathed in the thermal waters came near the instrument, and could not be distended by the usual method, a fresh charge of electricity, until he had left the room.

## TO NAVIGATE MISSOURI RIVER WITH AIR-PROPELLED BOATS

The treacherous Missouri River, with its disappearing channels, movable sand bars, and general unnavigability, is to be attacked from a new angle in a determined effort to make its mighty but wayward course useful to commerce. Big barges, drawing when loaded only eight to ten inches of water, will be equipped with air propellers, driven by gasoline engines. A mile ahead of each string of barges a small motor pilot boat will hunt the shifting channel and sound for obstructions, signaling the course back to the barge steersmen. With the experiment a success, huge deposits of lignite coal that lie along the river through the Dakotas will be made available, and the isolated country in the great valley, far from any present transportation, will find a way to market.

## JUGGLER BALANCES ON FLIMSY PERCH HIGH ABOVE PAVEMENT

While his companions hugged the coping in a perspiring effort to keep their eyes from Herald Square, 25 stories below, "Dare Devil" Reynolds of New York City recently gave an unprecedented exhibition of juggling skill. He placed a kitchen table astraddle a corner chimney, and on the table two chairs, face to face. A third chair rested with two legs on each of these. A fourth chair he set at a slant against the back of the third. Then he climbed to the top of the rickety perch, stood upright, pulled three billiard balls from his pockets, and tossed them nonchalantly about, seeming to forget that a dropped ball would shoot down, and down, to a crashing finish on the pavement far below. The stunt completed to his satisfaction, he sat on the tilted chair, slowly stretched his feet over Herald Square, and balanced himself on two chair legs.

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**This Is the Way a Juggler Gave Publicity to a Recent "Drive." He Went through His Tricks Just 25 Stories above a New York City Street**

¶The subject of accident prevention is considered so important by the Department of Labor that it has published a pamphlet, written by a government expert, in which are printed instructions on how to give an illustrated lecture on the subject. These pamphlets are being sent out to the larger employers, many of whom already have begun campaigns along this line.

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## LOCOMOTIVE KILLS "COOTIES" BY SUPPLYING LIVE STEAM

In preparation for the reception of returning soldiers, an eastern camp installed a complete steam and hot-water sanitary plant to discourage visiting "cooties." So popular and so necessary did this department prove that it was unable to keep up with the demand for its services. The resourceful engineers promptly laid a switch track to the railroad, several hundred yards away, and a locomotive was brought in alongside the sanitary station. With live steam piped into the building from this extemporaneous assistant, the task of execution was soon completed.

Locomotive Supplying Live Steam to a Military-Camp Sanitary Station to Help Out in a Rush Demand for the Execution of "Cooties": The Track was Specially Laid for the Occasion

## CHEMICAL ODORS AS WARNING SIGNALS IN MINES

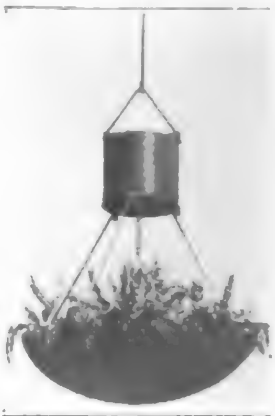
Scents from odorous chemicals may be used as warnings of gas leakages in mines, if a practical plan results from tests being made by the Bureau of Mines. Experimenters are using an "odorometer," which consists of several flow meters arranged so as to measure a stream of air that passes over or through the chemical being tested. Before the tests are made, this odorized air is mingled with a volume of fresh air, also measured. By comparing the weight lost by the chemical during the passage of the air through the apparatus and the volume of air into which the chemical has been vaporized, it is possible to determine the percentage of vaporized chemical in a given volume of air. Olfactory tests of the scented air are made by smelling and classifying as to strength of odor.

## DISCOVER PEACE-TIME USE FOR CARTRIDGE CLOTH

Experiments have disclosed the fact that silk cartridge cloth, used by the army for making bags to hold the explosive charges of heavy artillery guns, may be rendered suitable for clothing and house decorations by a simple process, and an oversupply of 17,000,000 yd. of the fabric, possessed by the War Department at the cessation of fighting in Europe, is to be sold to the highest bidders. Cartridge cloth, as prepared for the army, is gray in color and impregnated with gum and oil. By boiling the cloth, it has been learned, these substances may be removed from the fabric, leaving it soft and smooth, and ready for dyeing or printing, though without sheen because of its heavy warp. The amount of cloth to be sold represents what was estimated to be a three months' supply for the artillery of the American expeditionary force.

## FLOWER BASKET THAT KEEPS PLANTS ALWAYS WATERED

The burden of remembering to water the plants has been lifted. An English inventor has patented an irrigating can, from the bottom of which projects a tube with a wick or string in it, allowing just enough water to escape for proper moisture. The flower basket hangs from the can itself, which may be as ornamental as desired.



Among the unusual shipments carried by an aerial-transportation company operating between Paris and Brussels was a consignment of 500 live lobsters, dispatched from the former city to the latter by aeroplane.

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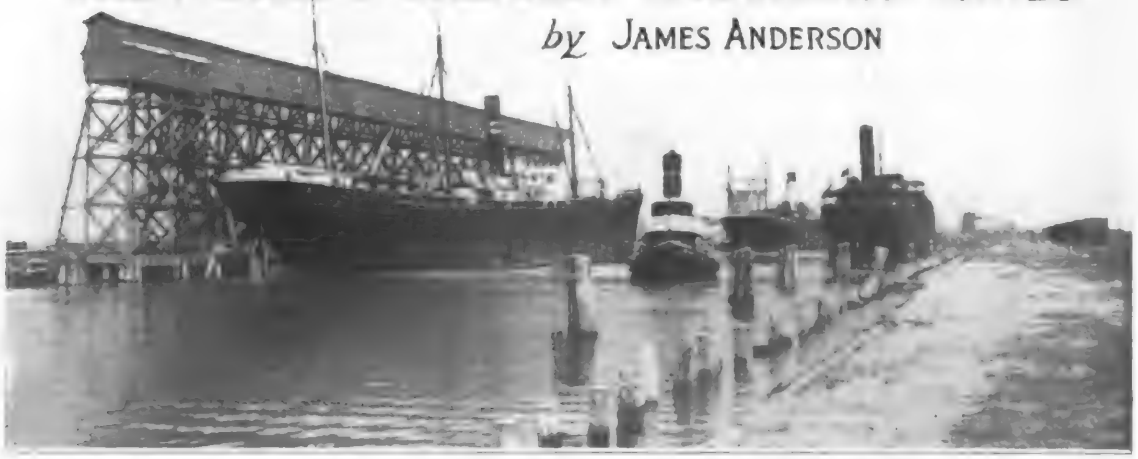
# THE WORLD'S GREATEST PHOSPHATE MINES

by JAMES ANDERSON



Tampa, Florida, has Become the Largest Shipping Port for Phosphate Rock in the World, with Facilities for Handling a Million Tons a Year. The Ocean-Going Steamers That Dock at Her Wharves Are Able by the Aid of Modern Loading Machinery, to Take on a Full Cargo in a Single Day and Depart before Night on the Voyage to the Markets of the World

TAKING account of stock is now one of the principal and vital occupations of the entire world. On every hand, in every land, merchants and manufacturers are preparing for the demands of the reconstruction period.

Back of this comes the figuring by governments, themselves, on the natural resources of the countries under their jurisdiction. Largely upon these resources the continued prosperity of any nation fundamentally rests. The country which has something to sell that all other nations require, but which they do not largely, if at all, possess, has, of course, a trade advantage.

Restrictions on international commerce during the war naturally threw every nation "on its own" to a very great extent, and focused attention on natural resources considerably more than was necessary in times of peace. In this country, some interesting "discoveries" were made when we came to stock taking; discoveries which were, in more than one case, entirely unexpected and of the greatest value.

Take one of those which may be said to have been made in Florida. Few Americans have ever looked upon that semi-tropical peninsula as a mining state of importance, and to many it will come as a surprise to learn that in one important mining product, phosphate, Florida today produces about 52 per cent of the entire world's supply, and about 82 per cent of the supply of the United States. Incidentally, these phosphate beds, underlying to a greater or less extent almost the entire surface of the state, are one of the great reasons for the wonderful productivity of Florida's soil.

PHOTOS BY GILLIAM SERVICE

Prospecting the Sides of a Quarry Pit near Tampa for Deposits of Soft Phosphate, Outcroppings of Which are Commonly Observed in Such Locations

Although, of course, they have been known and worked for years, it was not until 1917 that the U. S. government really turned its attention seriously to the Florida phosphate mines, as one of the greatest of its natural assets. At that time, a general effort was being made to increase the production of phosphate rock, owing to the conviction that the people of the United States must greatly increase their production of foodstuffs. For intensive agriculture implies a much greater use of fertilizer. It was then that the eyes of all those familiar with Florida's surprising richness in this particular were turned toward that state, and despite many handicaps due to the war and the consequent short-



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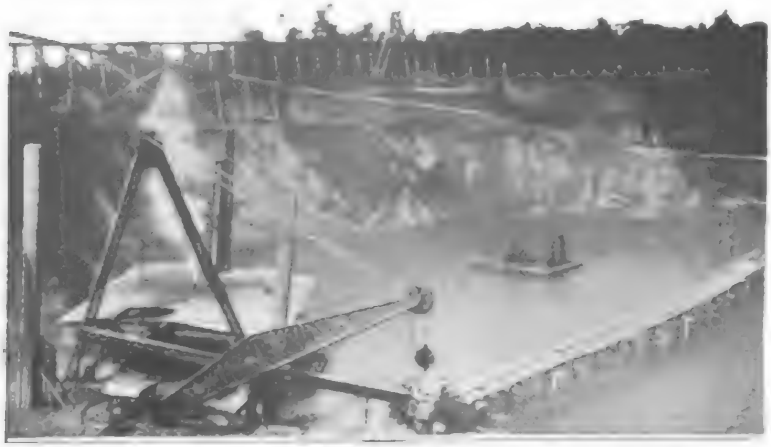
age of ships and railroad cars, congestion of freight and scarcity of labor, Florida phosphate miners did their bit to help



Hard-Rock Phosphate Pits Containing Water are Worked with Floating Dipper Dredges. The Dipper Dumps Its Load into a Steel Mine Car, and It is Then Carried on Rails to the Washing Plant, Located on the Bank above the Dredge

out and relieve the embarrassing situation. In the vicinity of Tampa are the greatest and richest beds of phosphate ever found. To keep our farmers supplied with badly needed fertilizer, the war quickly gave Tampa the distinction, which she is likely to hold indefinitely, of being the largest shipper of phosphate rock in the world. The facilities at its port were developed until they are now the finest in existence for the loading of this product, and the port has the distinction of having the world's fastest phosphate-loading elevator. It is possible for large vessels to arrive, take their full cargo, and depart in the same day.

With present facilities, Tampa can ship, through its port alone, something over 1,000,000 tons of phosphate a year. In normal times most of the rock is carried to the markets of the world by boat; and a number of boats were engaged regularly in this traffic. When the war broke out, the government commandeered some of these craft, but when the importance of the phosphate industry was pointed out, the boats were allowed to continue in the trade.

We had not been in the world's conflict long before it was discovered that Germany had control of some of the best of the phosphate mines in the vicinity of Tampa. The custodian of alien-enemy property was, however, quickly on the job and the mines owned by the Germans

PHOTOS BY GILLIAMS SERVICE

The Soft Phosphate is Dried in a Rotary-Kiln Plant, and Then Goes to Crushers and Pulverizers in the Room above the Kilns. The Pulverized Product is Discharged through the Pipe by Air Pressure, and Finally Carried in Cars up the Covered Trestle to the Sacking and Storage House

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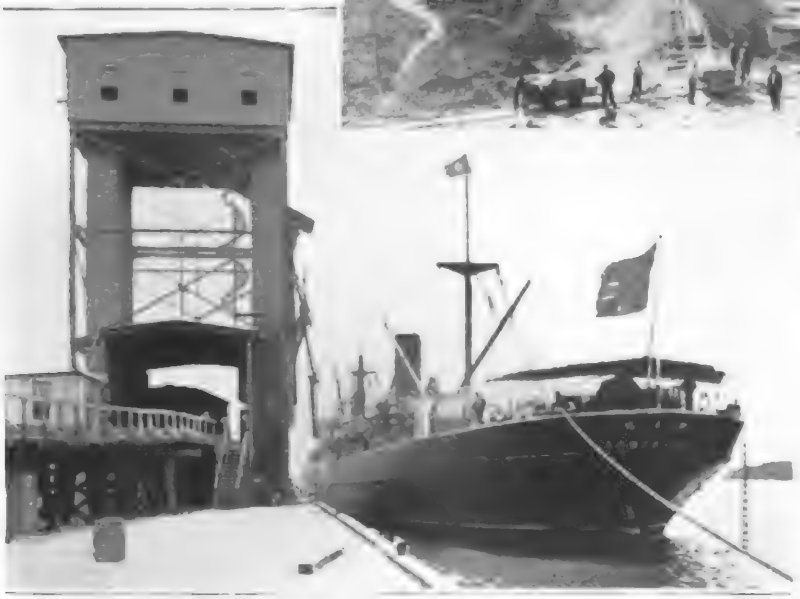
were promptly taken over by the United States, and the danger of their destruction immediately averted.

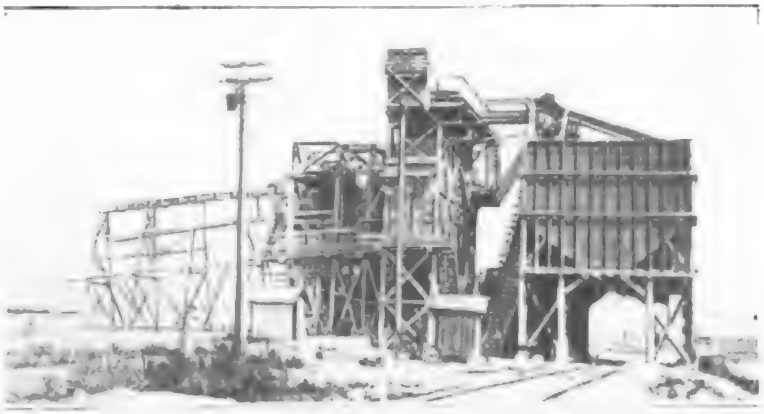
The war quickly made evident not only the immense importance of our Florida phosphate mines for the production of fertilizer for intensive agriculture, but also the inestimable value of the products of these mines for military purposes. Everyone knows the importance of phosphorus in the making of explosives and war munitions. A charge of phosphate rock, coke, and sand, upon being heated in an electric furnace yields about 86 per cent of crude phosphorus. This is purified by filtration through porous tile, chamois skin, or canvas, the operation being carried on under lukewarm water, which keeps the phosphorus liquid. It is usually marketed in the form of sticks, which are made by conducting the phosphorus from the melting pot through a pipe surrounded by cold water. It solidifies in the pipe and can be removed as a continuous rod. Red phosphorus, employed extensively in the manufacture of matches, is made by heating white phosphorus in iron pots provided with air-tight lids.

Phosphate Plant Consisting of Crusher, Washer, and Storage Bin, to Which the Rock is Conveyed in Little Cars That Run up the Inclined Track



The Fastest Phosphate-Loading Elevator in the World Is a Part of Tampa's Dock Equipment, and Makes It Possible for Large Vessels to Dock in the Morning, Take Their Cargo, and Leave the Same Day

But this is not the whole story of the importance of the Florida phosphate mines, as there are various valuable medicinal preparations of phosphorus. Owing to its remarkable influence on the growth of bone in young animals, it has been used in the treatment



This Picture Shows a Washing Plant for the Pebble Form of Phosphate: The Hopper Construction of the Storage Bin, Which Is at the Right, Enables It to Deliver the Treated Phosphate Directly into Cars Pulled In on the Track Beneath

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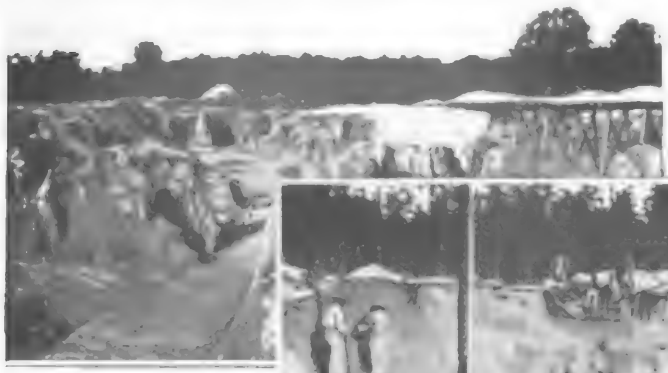
of rickets and other bone affections in children and adults. It is most effective as a nerve tonic, and is also used as a remedy for skin diseases. The hypophosphites have been recommended for pulmonary troubles, and the glycero-phosphates are useful to stimulate metabolism. Dilute phosphoric acid is used as a gastric stimulant.



A Worked-Out Pit, Whose "Skeleton" Consists of Limestone Cones, from Between Which the Soft Phosphate has been Removed

Simplest Method of Mining Soft Phosphate: Digging by Hand after Stripping the Surface with Horse Scrapers

Typical Soft-Phosphate Pit, Partially Worked: Nodules of Hard or Rock Phosphate Commonly Occur in These Deposits, and Some of Them are Seen at the Bottom of the Pit, Mixed with Lumps of Flint. The Soft Material is Shoveled into Buckets on a Derrick Boom

Bronze manufacturers have long been aware that their product is greatly improved in quality and strength when fluxed with phosphorus. The alloys prepared in this way, known as phosphor bronzes, may contain only about one per cent of phosphorus in the ingot, which may be reduced to a mere trace after casting, but the phosphorus nevertheless enhances their value for use in making implements which require a hard, strong metal.

One of the most important constituents of the material used in distress signals at sea is phosphorus, in the form of calcium phosphide. As various phosphorous compounds make a very dense smoke,

Hydraulic Mining Is the Process Employed to Recover Pebble Phosphate from the Pits, the Product being Picked Up by Electric Pumps and Forced through 10-Inch Pipes to the Washing Plant

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this fact was utilized in a most curious way during the war, when clouds of phosphorous smoke were constantly employed to conceal vessels in danger of submarine attack.

Acid phosphate, for years one of our most popular soft drinks, could not be manufactured or served at the soda counter, if it were not for the output of the Florida mines.

The methods of phosphate mining in Florida are entirely different from all other mining operations, and very varied and interesting. There are several natural varieties of phosphate, known principally as hard rock, soft, and pebble. They are all frequently found in close conjunction, but require different mining and handling.

Literally speaking, the phosphate mines are open pits, dug down for many feet below the surface of the earth. Almost all the work in the mines is done by negro labor. In some cases phosphate rock, as it is loosened by the laborers in the pits, is shoveled into buckets attached on a derrick boom, by which means they are lifted with their contents to the surface. As a rule, a pick and shovel are the tools used by the miners; but in other instances, the surface is first stripped with horse scrapers, and then the miners dig the phosphate carefully out by hand from between limestone cones.

What is known as pebble phosphate is mined principally by hydraulic power. This pebble phosphate is raised from the pits by electrically-driven pumps and forced through 10-in. pipes to washers on the surface.

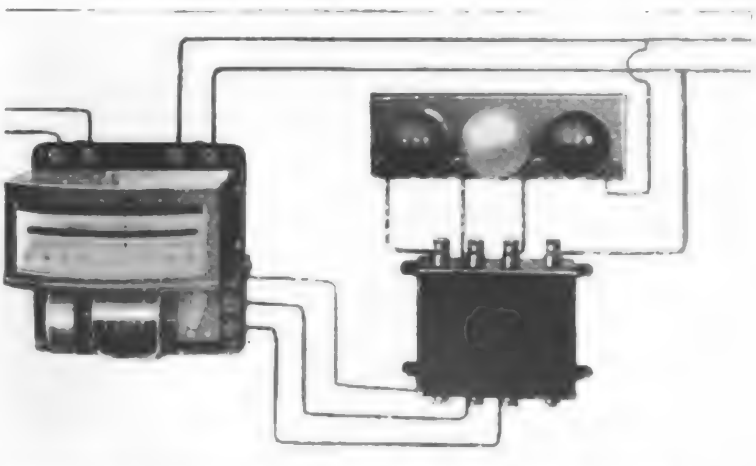
When the soft phosphate is brought to the surface it is conveyed to a rotary kiln, where it is dried. It is then taken to crushers and pulverizers, in a house above the kiln. When pulverized, the product is conveyed by air through pipes, and by cars in covered trestles to the storage and sacking house, after which it is ready for shipment.

Hard-rock phosphate is dried in sheds especially constructed for the purpose. The rock is then piled on wood, which is set on fire. After this process has been completed, the phosphate is ready for pulverizing and sacking.

In some cases, the hard-rock phosphate mines are flooded and the pits are worked by floating dipper dredges, which lift the dripping rock in huge scoops to small mine cars, in which, by means of cables, the product is conveyed along trestled railroads to the plants above, where the phosphate is dried and prepared for shipment.

## PYROMETER FLASHES SIGNALS WHEN TEMPERATURE VARIES

It is not often that scientific measuring instruments class as labor-saving machines, but a new pyrometer marketed by a Philadelphia concern is distinctly in that category. The pointer of the instrument, automatically depressed at one-minute intervals, makes contacts that operate a three-way relay. This causes a white light to glow at the furnace room so long as the temperature is correct within 10°; a red light if it goes too high, and a green light if it falls below normal. The operator usually employed to watch the scale and flash signals with a hand switch, thus becomes superfluous. In a pyrometer equipped with a motor or clock-driven switch, a number of thermocouples can be caused to operate separate signals. Automatic temperature control may also be arranged, or a system that will send proper signals during the course of an intentional progressive increase in temperature.



The Pointer of the Pyrometer Scale at the Left, Making Contact Once a Minute, Operates the Three-Way Relay at the Right and Causes One of the Three Lamps to Glow, Its Color Indicating Right or Wrong Temperature

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## AUTOMOBILES SIDE BY SIDE HIT LOCOMOTIVE

Because of their frequency, grade-crossing accidents are seldom of general interest; but a recent mishap at Grand Rapids, Mich., was a bit unusual. Like many another it happened in the wee small hours; but unlike any other on record it involved two locomotives and two automobiles. The cars were racing homeward, side by side, from a high-school dance. Too late the drivers saw the oncoming double-header. The first locomotive roared passed them, but together they crashed into the second. Both machines were dragged many feet. The youthful automobilists suffered nothing worse than a bad fright.

**This Grade-Crossing Smash-Up Was Unusual in Involving Two Automobiles. Racing Side by Side down a Darkened Street They Crashed at the Same Instant into a Freight Engine. No One Was Hurt although Both Cars were Dragged Many Feet**

## FAME OF TEXAS BAT ROOST SPREADS ABROAD

The municipal bat roost and the ordinance prohibiting the destruction of the little animals were introduced in San Antonio, Tex., by a local doctor several years ago. The city has since enjoyed such gratifying immunity from mosquitoes and malaria that the doctor's fame has gone abroad. He has now been invited by the Italian government to establish a "battery" in that country, and by the British to experiment with his idea in India. The insufferable heat and prolonged rains of the latter country often make the mosquito nuisance a serious menace to national health.

## ELECTRICITY HEATS WATER IN NEW BOILER

Electricity is used for converting water into steam in a new type of boiler recently developed by European experimenters. It is intended especially for use in locations where current generated by water power is available, but where coal is difficult to obtain. Narrow tubes of insulating material, vertically placed, are connected with the boiler and filled with water. High-voltage currents are sent through these tubes by means of electrodes at each end, and the resistance of the water creates an intense heat that quickly produces steam. Water entering the lower ends of the tubes leaves the upper ends in the form of steam. By moving the electrodes the strength of the current is regulated. Tests have shown the boiler to be extremely efficient.

## MOTORCYCLIST STANDS ERECT ON SADDLE OF MACHINE

A motorcycle becomes as "skittish" as an unbroken colt when driven on a slippery stretch of ocean beach. But there is a western motorcyclist who is so much a part of his machine that he turns the trick while standing erect on the saddle. During a recent gathering of motor-

**The Wet Sand Gives the Motorcycle a Tendency to Slide Out from Under the Rider Which He must Counteract by Constant Shifting of His Body**

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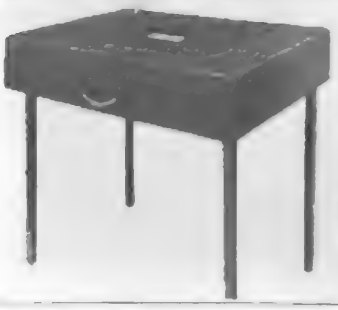
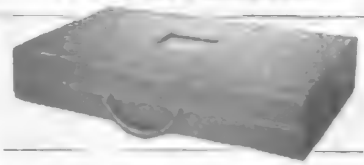
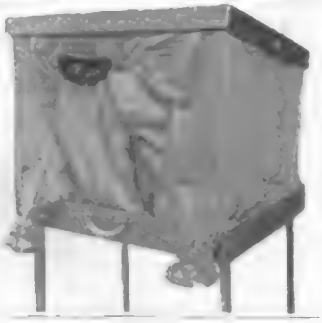


Fitted with Legs, as Above, the Dark Chamber Becomes a Complete Developing Table; Its Ruby-Glass Door is Seen in the Top. In the Center the Case is Closed for Traveling

The Portable Dark Room as It is Used by the Photographer





Opened and Set Up for Use, as Above, the Dark Room is Large Enough for Any Ordinary Photographic Work; Note the Elastic Cuffs for the Hands, and the Eye Piece

cyclists he toured up and down the water's edge in this way at a speed of 25 miles an hour. His machine skidded several times, but a quick shifting of his weight always saved him from a fall.

## CUBAN GENERAL'S MEMORY HONORED BY MONUMENT

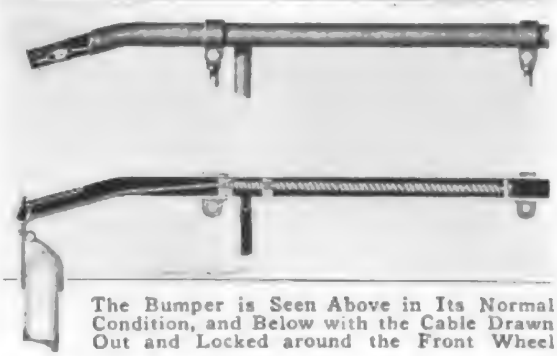
Cuba is to pay honor to the memory of General Maximo Gomez, the island republic's military hero, by erecting a costly monument. A first prize of $25,000 was awarded recently to Aldo Gamba, an Italian sculptor, for a model of the memorial, which is to cost $200,000. Second and third prizes went respectively to Huertas Cabarrocas, a Spanish-Cuban, and Gutson Borglum, an American. General Gomez became popular as the leader of the Cuban forces in the war for independence from Spain, from 1895 to 1898. He also took a prominent part in the Ten Years' war, a revolt which began in 1868. On the day of his death, June 18, 1905, the general's family was presented with a gift of $100,000 by the government of Cuba. At the conclusion of the Spanish-American war, General Gomez was honored at a public reception given by the American forces occupying Havana at that time.

## COMPLETE PHOTO DARK ROOM PACKS LIKE SUITCASE

The dark room, necessary evil, has always been the one rigid obstacle to the perfect flexibility of the photographic art. Now, however, the operator can carry a complete dark chamber along with him, and develop his exposures when and where he pleases. The "room" packs in a case less than two feet long, about a foot wide, and four inches thick. It opens to a height, in the larger size, of 18 in. in front and 13 in. in back, with walls of light-proof fabric. Elastic cuffs at the sides admit the operator's hands, while he looks through a hood in front, equipped with two shutters that are opened by pressure on the hood, and instantly close on release. Trays and plates are inserted through a ruby-glassed door in the top.

## AUTOMOBILE LOCK AND ALARM INSIDE TUBULAR BUMPER

The tubular bumper on the front of an automobile is used by a Minnesota inventor as container for a steel cable,



The Bumper is Seen Above in Its Normal Condition, and Below with the Cable Drawn Out and Locked around the Front Wheel

with a padlock on the end, which may be pulled out and snapped around the front wheel when the car is parked. If any attempt then is made to move it or to pull on the cable, a lug inside the bumper is drawn against a spring contact, and an alarm bell in the car rings loudly. A retractile spring restores the cable to its case when it is released, and a cap, held by a spring, returns to its place covering the end of the bumper. The wiring is concealed in a tube.

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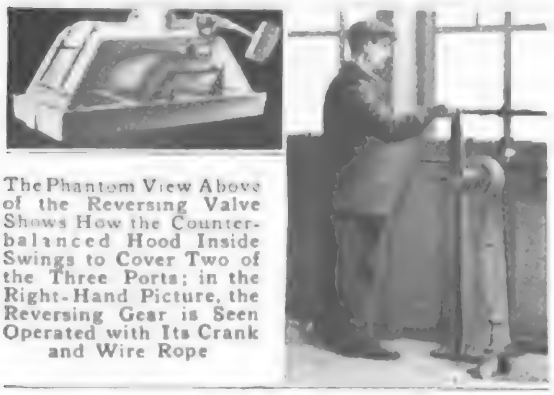
## ADJUSTABLE FIXTURE JOINT WILL NOT BREAK WIRES

An objectionable feature of adjustable electric-light fixtures has been their tendency to wear out wires at the points of adjustment. In a new fixture about to be placed on the market, the inventor declares he has overcome this objection by the use of extra-long, open knuckle joints, which allow slackness in the wire at such points, thus preventing chafing because of tightness, or breakage because of sharp-angle bends. Locknuts tighten the joints. One fixture in which these joints are used has an upright holding two lights on adjustable arms.

The Open Knuckle Joints of This Adjustable Electric-Light Fixture will Not Chafe or Break the Wires Running through Them

## LARGE GAS-REVERSING VALVE EASILY OPERATED BY HAND

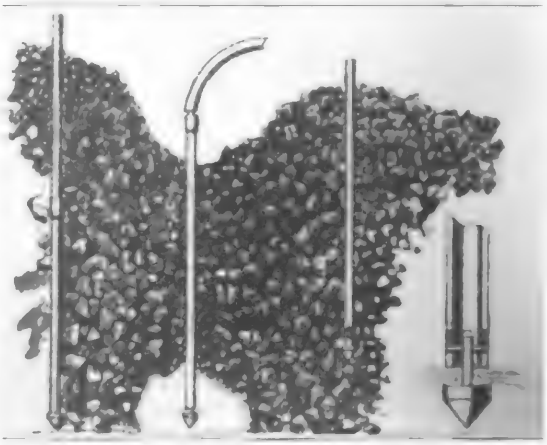
In metal-working furnaces, the flow of fuel gas must be periodically reversed. With a type of valve recently placed on the market this can be easily done by hand; a 36-in. valve, for instance, being reversed in from 3 to 7½ seconds with a pressure not exceeding 25 lb. The base of the valve is a rectangular iron pan containing water, and with three ports in the bottom, the center one connected to the chimney and the others to the furnace. The whole is covered with an iron case, with a door at each end and a gas intake at the top. Inside is a semielliptical hood, which covers two of the ports, and is swung on counterbalanced levers to connect the center port with either of the others. The edge of the hood hangs in the water, which makes an effective seal. A hand lever operates the valve through a wire rope.



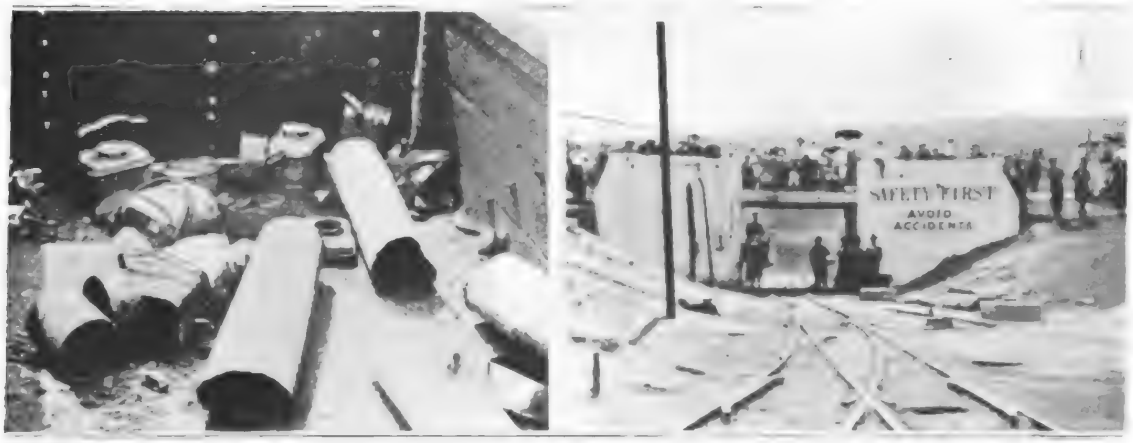
The Phantom View Above of the Reversing Valve Shows How the Counterbalanced Hood Inside Swings to Cover Two of the Three Ports; in the Right-Hand Picture, the Reversing Gear is Seen Operated with Its Crank and Wire Rope

## FIRE-FIGHTING DEVICE GOES TO SEAT OF COMBUSTION

A fire-extinguishing device has been produced which is particularly adapted to dealing with spontaneous combustion, as in coal piles and other places where the source of the fire cannot be reached by the ordinary apparatus. It consists of a single pipe, or conduit, or of a plurality of such pipes connected together. The lowermost section of the device is a conical driving member, which also serves as the nozzle for the ejecting of water. This cone-shaped member is easily driven into a coal pile, and it closes and protects the end of the pipe during the driving operation. Within the lower end of the pipe are opposite longitudinal slots, into which extend the ends of a cross pin carried by the stem of the driving member, the inner end of this stem being so made as to deflect water into the slots.



For Fighting Fires in Coal Piles, the Long Pipe Nozzle may be Driven to the Bottom of the Pile, the End being Protected as Seen in the Section at the Right




PHOTOS BY JENNINGS

**The Charred Interior of One Little Mine Car is Shown at the Left, Cluttered with Empty Powder Cans, Dinner Pails, and Miners' Caps, Mute Evidences of Disaster. This Picture was Taken a Few Minutes After the Death Train was Hauled from the Mine. The Tunnel Entrance may be Seen Dimly beneath the Bridge in the Right-Hand Photograph**

## SCORES BURNED TO DEATH IN MINE TUNNEL

A mine disaster of peculiar horror recently cost nearly a hundred lives in Wilkes-Barre, Pa. Workers near the mouth saw 14 mine cars enter the tunnel, drawn by an electric motor. The little cars were packed with men and boys on their way to work in a distant drift. In the two central cars had been placed seven kegs of black powder, weighing about 300 pounds. A moment later those above ground were horrified by mysterious shrieks of agony. They entered the tunnel to find dead and dying piled in unrecognizable heaps along the track and in the cars. Survivors told them that the steel powder kegs had in some way short-circuited the overhead trolley wire, igniting the powder, which flared and grew to a mass of roaring flame. The draft from the ventilating system had sucked the flame in upon the helpless miners; which explains why those outside were first advised of disaster by the cries of the dying within, trapped by the narrow passage.

PHOTO BY JENNINGS

**The Curious Crowd is Shown before the Mouth of the Mine in Which Four Score were Killed by an Explosion. In the Background, to the Left of the Loaded Cars, Is the Death Train. The Cause of the Disaster is Disputed, Some Claiming a Short Circuit between the Overhead Trolley Wire and the Steel Powder Kegs in the Cars**

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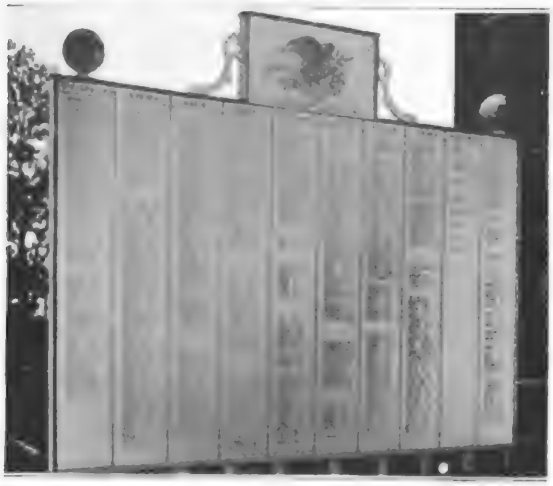
## HONOR ROLL ADORNS STREET IN SOUTHERN CITY

Honor rolls have become a familiar sight in offices, churches, and municipal buildings; but in Griffin, Ga., the local



The Red Cross Society of Griffin, Georgia, Chose the Center of a Principal Street as the Location for Their Tribute to Local Service Men

Red Cross society has placed a huge "roll" on one of the principal streets. It stands in the green parking, 15 ft. high, with the symbol of the Red Cross on two large electric bulbs. Gold stars appear against many of the 1,800 names, reminding the townspeople each day of their privilege to prove that the dead have not died in vain. The names appear on both sides of the roll, those of white soldiers on one side, those of colored soldiers on the other.

## AUTO CARRIES SECOND ENGINE TO SHOW OILING SYSTEM

A Los Angeles salesman is driving around in a car that has an engine at both ends. The one in the rear, however, is there solely to demonstrate the virtues of a new lubricating attachment. Instead of using gasoline, it is turned over with a geared crank, and the prospective customer observes the oiling action through glass panels in the motor base. The demonstrating engine is mounted at an angle equivalent to a 10-per-cent grade, to show that all cylinders receive oil equally in that position.

Hand-Driven Engine on Automobile's Rear Deck, for Demonstrating a Device That Lubricates All Cylinders Uniformly on Grades

## DOORS ON GANGWAYS STOP TRESPASSING ON ROOFS

Considerable trouble was experienced by a western railroad in preventing trespassing on the roofs of the company's oil tanks, reservoirs, and buildings, reached by gangways, until a scheme for closing this means of entrance was put into practical use. Doors provided with padlocks were placed in frames built on the gangways, and, as further discouragement for would-be explorers of the railroad property, guards were placed on the sides of the door frames, thus making it impossible for anyone to pass the obstructions by crawling around them.

These Locked Doors, with Their Guards, Effectively Bar Trespassers from the Roofs of Railroad Property in a Western City

## CITY FREIGHT TUNNEL TAPPED FOR THEATER VENTILATION

A number of Chicago theaters are playing to midwinter crowds this summer as a result of a revolutionary change in their ventilating systems. The old air intakes above the roofs were dismantled. Shafts were sunk to the cool freight tunnels which burrow their way from outlying coal and freight yards to the subterranean vaults of skyscrapers and department stores. Here was found cold air in abundance, needing only a little filtering to remove the dust of underground traffic. It is believed, too, that this air is far more germfree and healthful than that drawn, as formerly, from above the smoky city.

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# EXPLOSIVE HARPOONS USED TO CAPTURE WHALES

WHILE whale hunting is not the important industry it was in the days before science found substitutes for sperm oil and whalebone, it has not been discontinued entirely. The picture shows a whaling ship, from which crews go in quest of the aquatic mammals, anchored near the Spitzbergen Archipelago in the Arctic Ocean. Torpedo harpoons, which explode after piercing the skin of a whale, are used by the hunters. Tied to the ship are the bodies of several sulphur-bottom whales captured in this manner.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*



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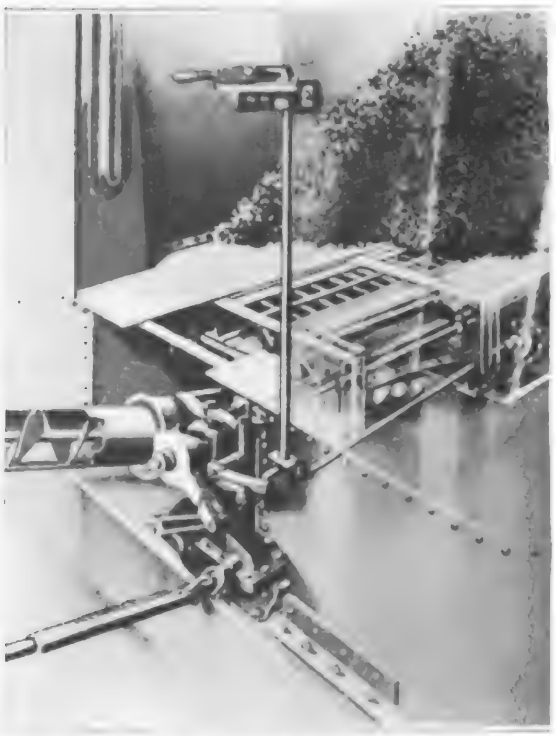
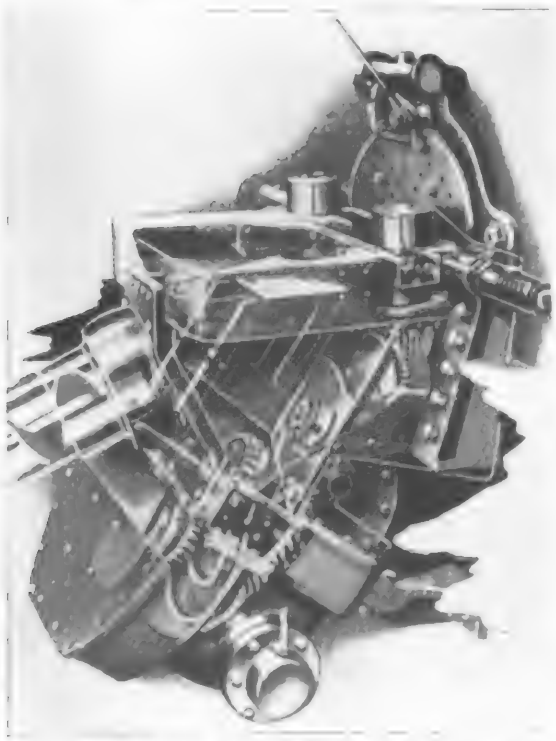
# STOKING MACHINE FEEDS COAL WITH SHOVELS



The Tender End of the Stoking Machine, Showing the Apertured Feed Plate and the Screw Pump for Conveying the Coal to the Engine: The Speed is Controlled by the Lever Above



The Stoker Shovels Swing from the Box at the Top to the Fire Box at the Right, Propelled by the Gears Below; the Slanting Chute Carries the Coal Elevator

A locomotive on one of the big railway systems is equipped with a peculiar form of mechanical stoker, whose performance during several months' trial has been exceptionally satisfactory. The coal, shaken through apertures in a feed plate, is carried from the tender to the engine by a screw conveyor, fitted with a flexible telescopic joint at the coupling. At the boiler head is a reciprocating elevator, which lifts the charges of coal to a box whose front end opens into the fire door, occupying the lower 5½ in. of the opening. In the rear corners of this box two shovels are pivoted to swing through a quarter-circle. By the use of a cam drive, these shovels are swung alternately forward, with a motion calculated to distribute the coal to the best advantage.

## AFRICAN AIR ROUTE TRACED FROM CAIRO TO THE CAPE

In all his dreams of a British Empire in Africa it is doubtful whether Cecil Rhodes ever imagined an air line from Cairo to the Cape. Yet it is expected that in October or November of this year, barely 17 years since his death, the first airplane will make the 5,000-mile journey. Three survey parties were started on the preliminary work less than two months after the signing of the armistice with Turkey. The first worked southward along the Nile from Cairo, locating landing places in plenty as far as Khartum. Thence to the lake country their task became increasingly difficult, possible landing places becoming so few that seaplanes will probably have to be used for this part of the route. Luckily the Nile is everywhere sufficiently wide to permit landing, whatever the direction of the wind. The second party experienced similar difficulty in the swamps, elephant grass, and jungles of the lake country; and are likewise expected to advise the use of seaplanes. The third surveying party discovered landing places in abundance on the last 2,000 miles to Cape Town, however, finding many South African towns eager for the establishment of aerodromes in their vicinity.

¶Applicants for enlistment in the air service will be carried in airplanes from their homes to the nearest aviation field on notifying the proper commanding officer of their intention.

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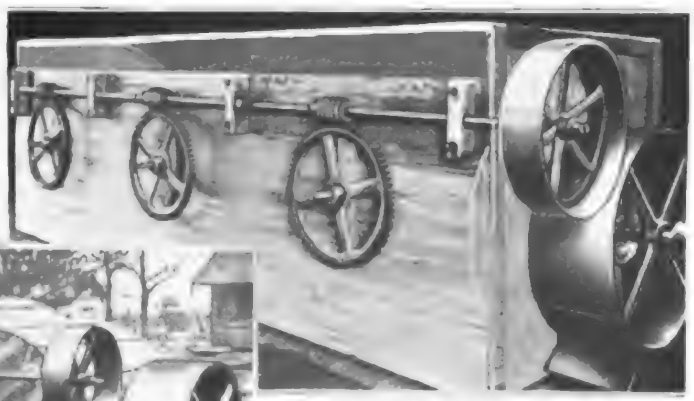
**FIRST STEAMSHIP COMPLETELY FABRICATED BY CHINESE SHIPBUILDERS**

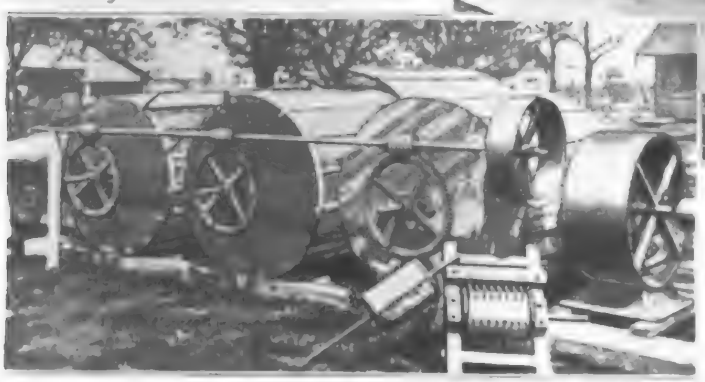
**CHINA marks another step forward in industry with the completion of the steamship "Mylie." This vessel, of 3,150 tons dead weight, is the first to be completely constructed, engine and all, in a Chinese shipyard by Chinese shipbuilders. The engineering and shipbuilding works responsible for it is located in Shanghai. The head of the concern has two sons studying in the United States, one at Dayton, Ohio, and the other at Notre Dame, Indiana.**

## BY-PRODUCT OF CIDER MILLS ADDS VALUE TO APPLES

Every year the diet of cattle grows less monotonous. Now, thanks to a recently developed process, they are feeding upon apple pomace. Despite its appetizing sound, this is not a pastry; it is the waste pulp from cider mills. Attempts to prepare this material by steam driers proved only partly successful. The highly satisfactory dehydration method now used operates at a temperature not exceeding 150°, utilizing a blower to carry off the moist air from rotary drying drums. Attached to the center shaft of each drum is a spiked pulley-shaped picker which shreds the pomace to hasten the drying. One bushel of apples ordinarily yields four gallons of cider. From this pomace then is made, by a patented process, one quart of sirup, worth 25 cents. Now, after dehydration, the residue or cattle ration, weighs about five pounds, and



Dehydrating Apparatus for Preparing Cattle Fodder from Apple Pomace: Each Gear Turns a Drum, and the Blower is Seen Just below the Pulley



**The Dehydrating Mill Dismounted to Show the Drying Drums: In the Foreground Are Two of the Cylindrical Pickers That are Carried by the Drums**

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brings three to four cents a pound, the by-product value thus comparing favorably with the cider itself.

## CLIMBS GIANT STEEL MAST TO REPAIR WIRELESS

Steeple jacks of iron nerve frequently win applause by shinning up flagpoles or scaling sky-scrapers; but the best of them were outdone recently by a volunteer repair man at the Chelmsford, England, wireless station. That plant's antenna tower is a sheer steel mast, 450 ft. high and perhaps 5 ft. in diameter, whose only footholds are the iron bolts in its flanges. When a storm destroyed the top aerial, the 55-year-old wireman scaled the bolts and replaced it. The long, hazardous ascent of the trembling tube took the venturesome climber nearly an hour, but he made it without mishap.

## PIONEER AIRPLANE HOSPITAL SUCCEEDED BY LARGER TYPE

Successful trial flights of the aerial "hospital," illustrated in Popular Mechanics Magazine for June, 1919, coupled with the approval of the French war office, has resulted in the design of a more elaborate machine. The new type is much larger, with space for a surgical staff of five, and complete operating equipment and X-ray apparatus. It also carries a tent which may be kept at a constant temperature by the heat of the motors. The big fuselage can accommodate four stretcher cases and four sitting, besides the attendant and pilot.

## AUTOMATICALLY CONTROLLED SEWAGE-PUMPING STATION

In a section of San Francisco where the sewers are below the level of the bay, a pumping station has been installed to raise the sewage high enough for gravity disposal. The pumps, housed in a concrete structure of dignified design, are electrically driven, and an automatic control board is provided, which practically takes the place of a human attendant. Besides the usual starting and stopping arrangement for automatic maintenance of level, an ingenious alarm system, operated by a relay, gives instant notice at the corporation yard if a pump, for any cause, fails to operate properly. One of the pumps handles without trouble the sticks, rags, and miscellaneous refuse commonly found in sewage, and a specially designed strainer, with a hoisting arrangement for cleaning, separates this material. A blower disposes of odors through a 75-ft. stack.

The Concrete Sewage-Pumping Station, as Seen at the Left, Has Quite a Dignified Exterior; Inside Is the Automatic Pumping Equipment Observed at the Right, the Electrical Controls being Located on the Left Wall

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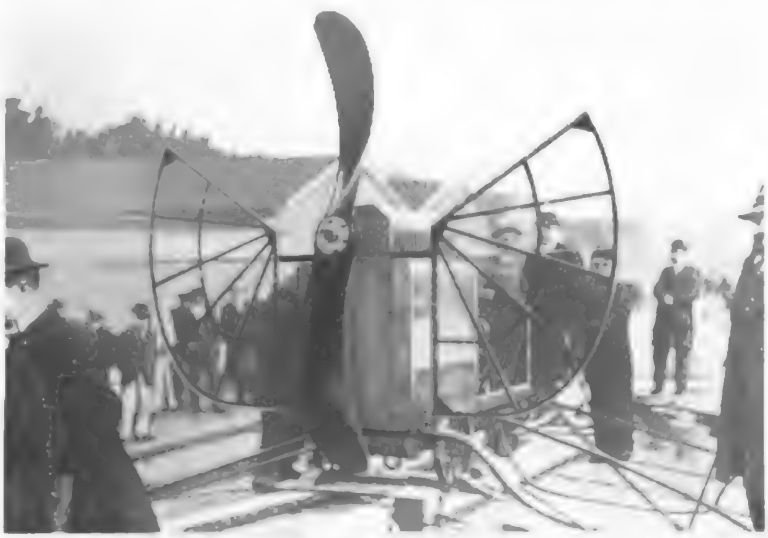
OIL WELLS OUTNUMBER HOUSES IN TEXAS VILLAGES

THE romantic call of the oil fields has in the past lured thousands to new-found pools in California, Wyoming, Kansas, and Oklahoma. The latest stampede has been to north-central and western Texas, where sleepy, sun-baked villages have become centers of activity and excitement. The airplane photograph shows a typical town, now studded with oil wells in back and front yards, overlaid with dirt and soot, and crowded with adventuring oilmen. Fortunes are made, and lost, overnight. One company risked $5,000 for leases which were later valued at $1,000,000. Whatever its effect on individuals, the discovery of this new field assures to America a domination of the world's oil trade.

## AIR PROPELLERS FOR BOATS ON TRIAL IN FRANCE

The use of air propellers for driving commercial water craft is being seriously studied in France. In the trials, made on rivers and canals, a barge 25 ft. long attained a speed of nearly 10 miles an hour with an engine of only 3 hp., and was able to tow eight small boats with 40 passengers. A 20-hp. automobile engine fitted with an airplane propeller drove a 120-ft. barge three miles an hour. Engines of 15 to 17 hp., with various types of propeller, ran an 11-ton tug 6½ miles an hour, and a 32-ft. raft with 12 passengers 7½ miles. The purpose of the experiments is to prove adaptability of the method to the weedy and sand-choked streams of France's African colonies, where navigation with underwater propellers is difficult to maintain.



One of the Airplane-Propeller and Engine Units Used for Driving Various Water Craft in French Experiments: The Equipment is Made Portable So That It may be Transferred to Different Boats on Trial

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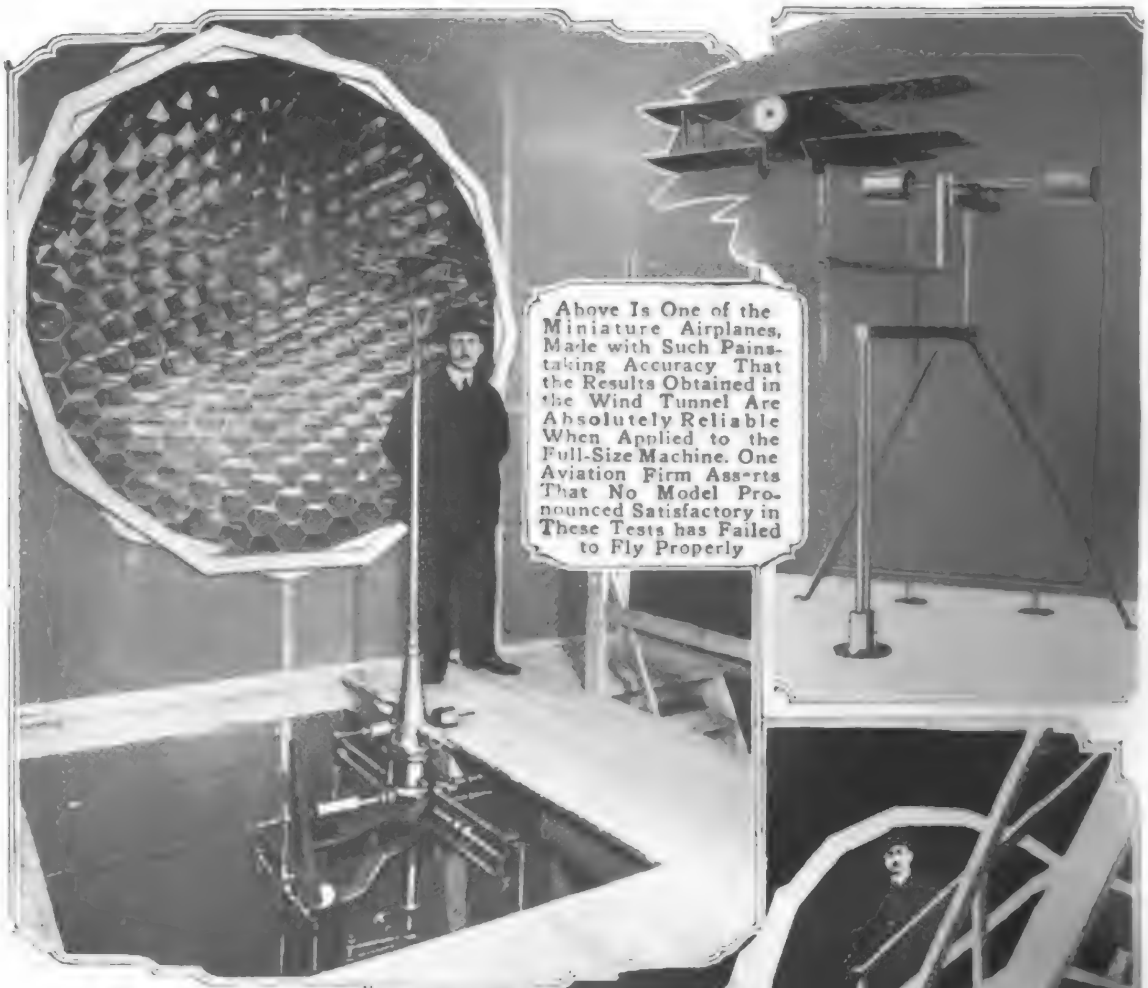
# AMERICA HAS BIGGEST AND BEST WIND TUNNEL



Above Is One of the Miniature Airplanes, Made with Such Painstaking Accuracy That the Results Obtained in the Wind Tunnel Are Absolutely Reliable When Applied to the Full-Size Machine. One Aviation Firm Asserts That No Model Pronounced Satisfactory in These Tests has Failed to Fly Properly

**This Is the Second Floor** of the Experimental Chamber Shown in the Lower Photograph. Sucked through the Honeycomb Screen, the Air Streams into the Chamber as a Smooth-Flowing Cylinder, Seven Feet in Diameter. It Encounters the Experimental Model, Producing Effects Which are Measured by the Delicate Aerodynamic Balance

This Tunnel for Wind Tests of Miniature Airplanes is Believed to Be the Largest and Best Designed in the World. Air is Sucked through the Horn-Shaped "Collector," Seen beyond the Experimental Chamber, through the Chamber Itself, and Finally through the Tunnel, or "Diffuser," in the Foreground. The Tunnel is Suspended by Steel Wires, Permitting Unhampered Air Circulation

PHOTOS COPYRIGHT



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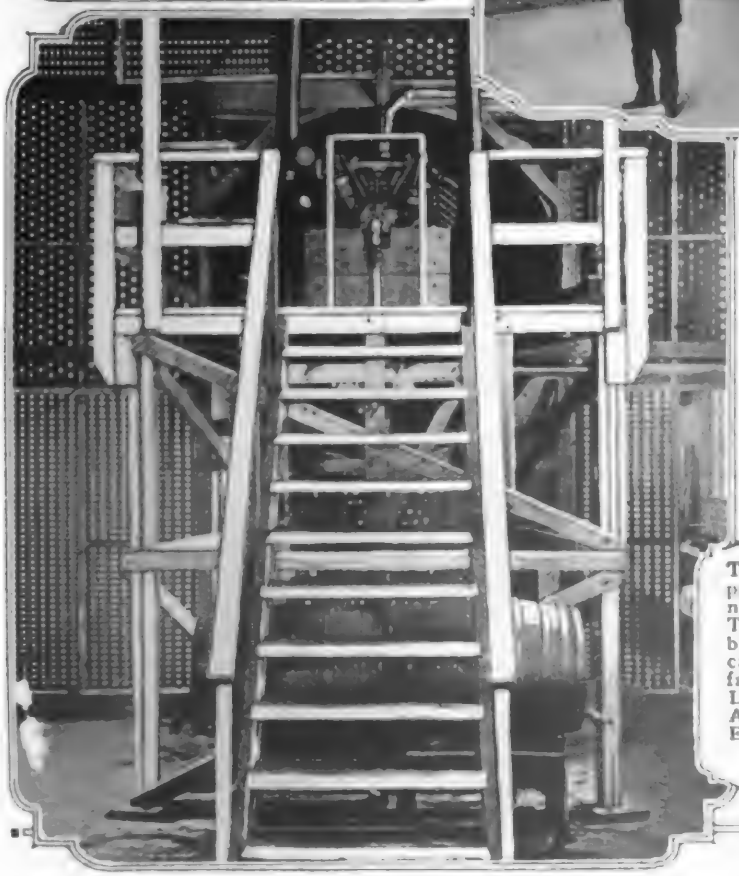
# FOR TESTS OF MODEL AIRPLANES AND AIRSHIPS

The Aerodynamic Balance is Mounted on a Stone Base on the First Floor of the Experimental Chamber. The Connection between the Model and the Balance is Shown in the Upper Left-Hand Corner of the Opposite Page

Above is Shown the Horn-Shaped "Collector," Which Guides the Wind against the Model in the Experimental Chamber. At the Outer Rim the Collector Measures 17 Feet Across; at the Wall of the Chamber, 10 Feet Less. The Cross Section Is a 20-Sided Polygon, Constructed by Placing Together Two 10-Sided Polygons and Rotating One Past the Other



The Staging Supports a 400-Horsepower Motor, Which is Directly Connected with a Three-Blade Propeller. The Speed of the Motor is Controlled by the Operator in the Chamber, Who can Thus Speed Up the Air Current from 40 to 100 Miles an Hour. The Last Figure Represents the Maximum Air Speed Yet Obtained, but It is Expected That the Figure will Shortly be Exceeded

KEYSTONE PHOTO NEWS



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## STREET OILING SPEEDED BY TWO-TIP SPRAYER

Fast and efficient work is done by a two-tip oil sprayer used on the streets of

More Surface is Covered in Less Time by This Two-Tip Oil Sprayer Used by the Street Department of a Western City

Oakland, Calif. Fastened on the end of the feed pipe, which is swung from the rear of the oil wagon, each tip has a regulating valve, opened and closed by a rod extending to a position convenient for the operator of the sprayer. The flow may be regulated from a fine spray to a solid stream. The oil is heated before it is applied to the street.

## LARGEST TANK SHIP AFLOAT HANDLES OIL RAPIDLY

A mammoth oil-tank ship, recently delivered to a transportation company, is said to be the largest of its kind afloat. The vessel has a dead weight of 18,000 tons, is 530 ft. long, and has a beam measurement of 68 ft. 5 in. Five boilers, with a working pressure of 220 lb. per square inch, supply steam to the compound turbines that operate the propelling machinery of the ship. Oil is used as fuel. On the vessel a system of pipes, four and one-half miles long, makes it possible to load or discharge separately four different grades of oil at one time.

¶ Resin resulting from the combination of certain naphthols may be used instead of shellac for polishing or insulating, according to a European scientific journal. When the resin is dissolved in benzol or toluol, and ligroin added, it is possible to remove the coloring of the resin, and leave a colorless material suitable for varnish.

## LITTLE FIRE TRUCK REDUCES AIRPLANE RISK

If there's any one thing that tends to fill the airman with gloomy foreboding, like the ambulance which haunts the large flying fields, it surely must be the chemical fire apparatus which bobs about one training center. No flier will deny its value, however, in combating fire which constantly menaces his airplane in the hangar and in the air. The little machine carries, in addition to the usual complement of extinguishers and axes, a chemical tank, holding 120 gal. at a pressure of 150 lb., said to be enough to tear the fabric from a burning wing. The chassis is of special construction, too, being shortened and with an added swing to the front wheels to enable it to turn quickly or twist through a crowded field.

Little can be Done for an Airplane in Flames a Mile above the Earth. If It Is near, or on, the Ground, However, This Little Chemical Apparatus will Save It, Unless the Flames have Gained Too Great a Headway

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## RULES FOR TRANS-PACIFIC AIR CONTEST ANNOUNCED

Additional rules to govern his trans-Pacific airplane contest have been announced by the motion-picture producer who offers $50,000 to the winner. The contest will be open from September, 1919, to February, 1920, and to licensed airmen of all nationalities. The flight must be completed within 12 days, and may be made in either direction. If flying westward the airman must start from Venice, Calif., and land on the mainland of Australia, on the Japanese Islands, or on the continent of Asia. If made in the opposite direction, the flight must end on the mainland of the United States.

## COMBINE SPEED AND SAFETY IN ELECTRIC SHEARS

Electrically driven shears, designed to be safe as well as fast, are among the latest devices on the market. The upper blade of the shears is actuated by an electric motor having a speed of 9,000 r.p.m., while the lower blade is stationary. Connection between the motor and blade

**While These Shears Cut with Great Speed, the Slight Oscillation of the Moving Blade and the Dull Ends of Both Blades Make Them Safe**

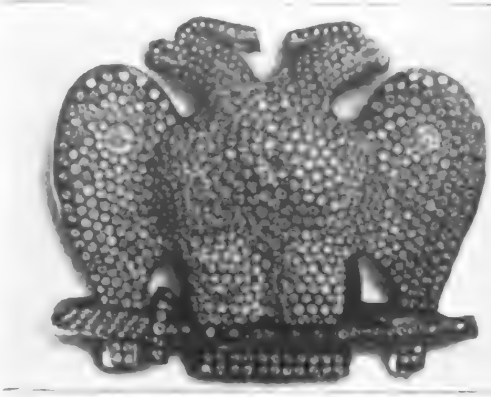
is by a link. As there is an oscillation of only 1/16 in. of the moving blade, there is small chance for injury to the operator of the shears.

## FLOWER-LADEN SHIP SUNK AS TRIBUTE TO DEAD

As part of memorial services for unknown sailors who died at sea in the great war and other conflicts, a battleship of the monitor type, covered with flowers, was sunk a short distance off shore by patriotic organizations of an eastern coast city. When the ship went down the blooms remained floating on the surface of the water, a tribute to the men of the navy whose bodies were buried at sea. More than 1,000 sailors took part in the ceremonies.

## MANY VALUABLE JEWELS COVER LODGE EMBLEM

Designed by an Indiana jeweler on the occasion of a lodge convention in his city, a gorgeous secret-order emblem con-



**Set in This Bejeweled Lodge Emblem Are 914 Diamonds and 12 Rubies. The Large Stone in the Center Weighs 5.02 Karats**

tains 926 jewels, and is valued at $50,000. A large diamond set in the center of the piece, which represents a double eagle carrying a sword, weighs 5.02 karats, while two set in the wings weigh four karats each. Twelve rubies are set in the sword, and diamonds cover the remainder of the emblem. The stones are set in a composition-metal mounting.

## MODERN BATHROOM ADJUNCT IS LUXURIOUS SHOWER STALL

Since the shower bath is no longer a clubhouse specialty, architects are making provisions for it even in the less pretentious homes and apartments. An arrangement which adds luxury to convenience consists of a stall opening from the bathroom, with a plate-glass door and tile walls. Three sets of shower sprays, with valves and fittings of nickel and porcelain, offer a variety of effects and an inviting appearance, without adding greatly to the cost of installation.

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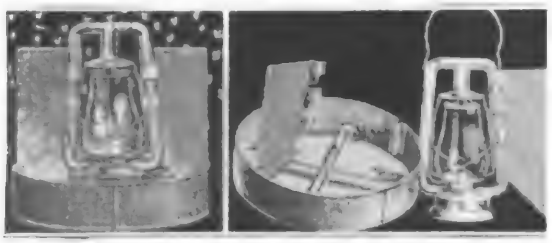
## LANTERN ATTRACTS MOTHS TO DEATH IN TRAP

Destroying moths by taking advantage of their natural weakness for flying about



**Moths Lured to This Trap by Light, Blunder against the Wings on the Lantern Frame and Fall into the Pan of Kerosene and Water Below**

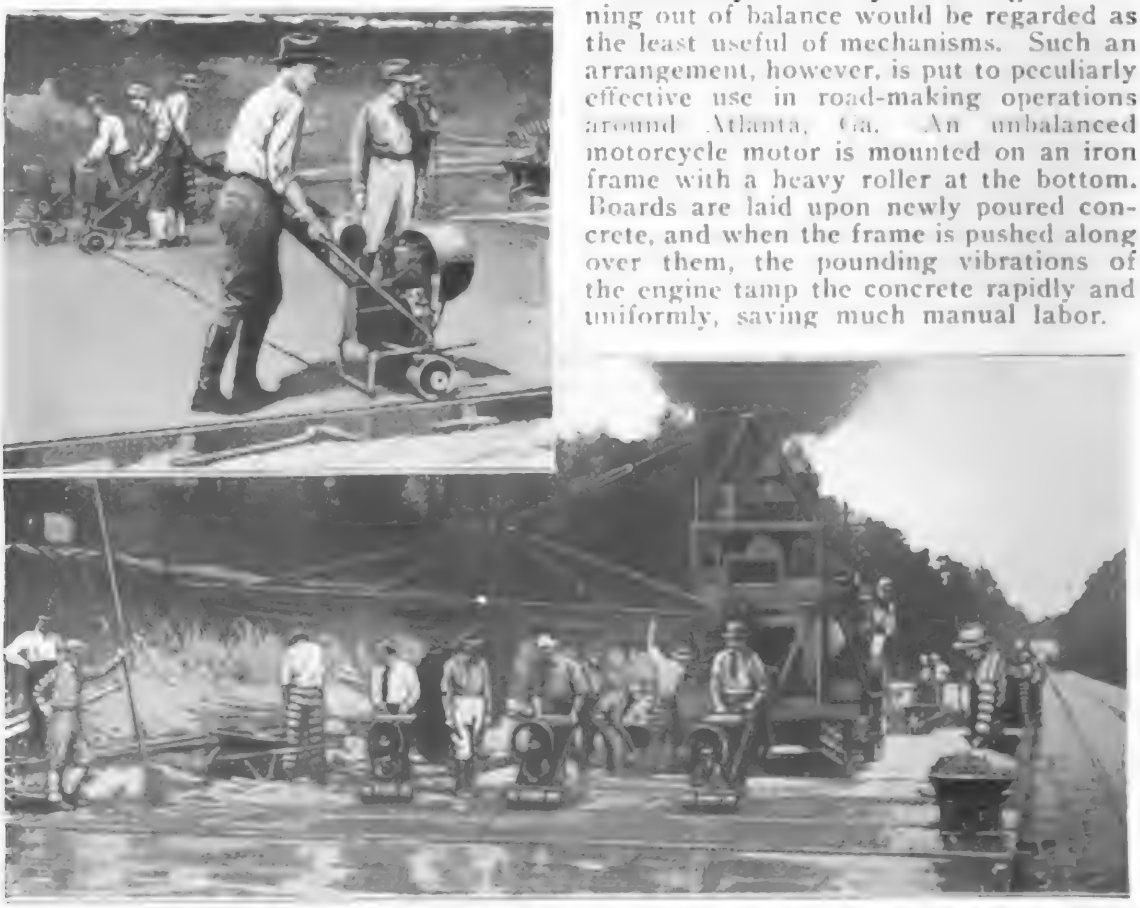
bright lights is accomplished by a patented trap recently placed on the market. Its essential parts are a shallow galvanized-iron pan, an ordinary tubular-frame lantern, and two metal wings for attaching to the sides of the lantern frame. The trap is set at night by lighting the lantern and placing it in the pan, in which it is supported at a little distance above the bottom by cross braces. The wings are then attached and the pan partially filled with kerosene and water. Moths flying around the lantern strike the wings and fall into the mixture in the pan, which kills them.

## CHINA EGG TRAPS SNAKE IN CHICKEN HOUSE

Swallowing a china nest egg was the fatal mistake which brought to a close the long egg-stealing career of a black snake. Found in a henhouse which it had been plundering, the reptile was vainly trying to squeeze through the hole by which it had entered the building. The lump formed in the scaly body by the nest egg would not permit the exit, and the snake was killed. A post-mortem operation was performed to remove the egg.

## UNBALANCED ENGINES USED TO TAMP CONCRETE ROAD

Ordinarily a two-cylinder engine running out of balance would be regarded as the least useful of mechanisms. Such an arrangement, however, is put to peculiarly effective use in road-making operations around Atlanta, Ga. An unbalanced motorcycle motor is mounted on an iron frame with a heavy roller at the bottom. Boards are laid upon newly poured concrete, and when the frame is pushed along over them, the pounding vibrations of the engine tamp the concrete rapidly and uniformly, saving much manual labor.



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**One of the Unbalanced-Engine Tamping Machines is Seen in Operation in the Close-Up View at the Top, and the Large Picture Shows How the Machines are Used in Battery for Building Concrete Roads**

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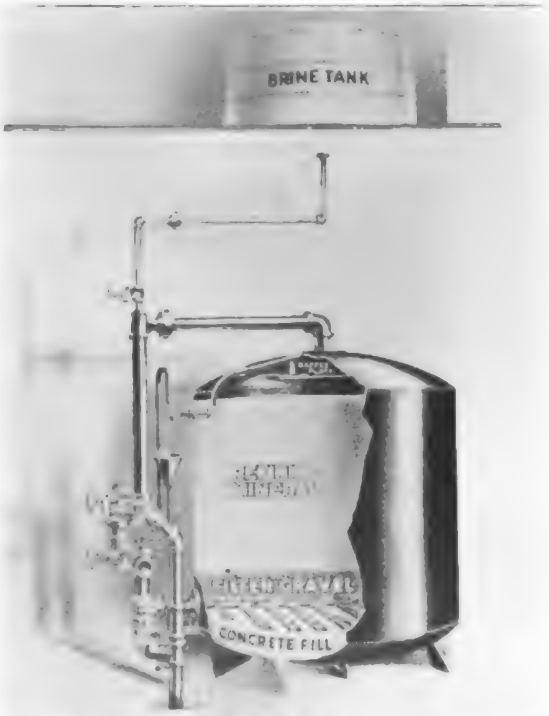
The Workman at the Left is Cutting Square and Hexagon Holes with a Drift, in the Old Way, While in the Center and at the Right the New Drill and Chuck are Seen in Operation in Lathe and Drill Press

## CHUCK AND DRILLS FOR HOLES SQUARE OR HEXAGONAL

Recent improvements in tools for drilling square and hexagonal holes have so simplified the process that such equipment is now available to the most modest of shops. A special drill with five cutting edges is used for hexagonal holes, and one with three edges for square holes. The drill is held in a floating chuck, with a standard shank for use in lathe or drill press. A steel guide, with a hole the size and shape desired, is fastened to the work, the drill following the edges of the hole. The outfit is particularly useful for making socket wrenches and similar work, drilling rapidly and accurately.

## SOFTEN HARD WATER BY AID OF MINERAL PRODUCT

Hard water, as is generally known, is water which holds in solution a quantity of sulphate and other salts of lime, taken up during its contact with earth and stone. It is objectionable on many counts. A simple but effective process of softening it has been evolved from the discovery that a sodium-bearing mineral, found in South Dakota and belonging to the zeolite group, will absorb lime in exchange for its sodium. In practice the method is applied by flowing the hard water down through a steel tank filled with the porous mineral in granular form, resting on a layer of filter gravel. At the bottom is a concrete lining and a network of collecting pipes for the softened water. When the sodium content becomes exhausted, in time, the flow of water is simply reversed, and then a brine solution is directed upward through the mineral until the sodium has been restored and




Partial Section of a Water-Softening Installation, Showing the Course of the Water through the Bed of Mineral, and the Brine Tank for Restoring Its Properties

the lime washed away. The equipment is then ready to resume its duties.

¶While landing at Albany, N. Y., to complete a flight from Dallas, Tex., a government bombing plane recently killed two children, injured another, and wrecked itself in a clump of trees.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*

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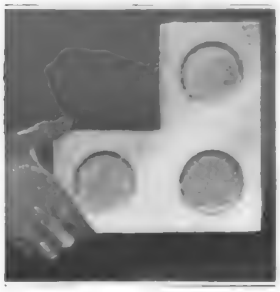
## STRONGER WALLS POSSIBLE WITH IMPROVED BRICK

More substantial walls may be constructed with a new type of brick, patented not so long ago by a retired contractor of the Southwest, and known as self-bonding and interlocking, the inventor states. On one side of each brick are two circular, bevel-edged bosses, while on the reverse side, in the same relative positions, are two depressions, into which the bosses fit exactly. The brick is recommended for domes or arches, chimneys, and hollow walls.



## GOVERNMENT-BUILT VESSELS SOLD BY SHIPPING BOARD

Ships constructed by the government to counterbalance submarine sinkings during the war are being sold by the Shipping Board to private operators. At a recent sale, seven American concerns purchased 19 steel vessels having an aggregate dead-weight tonnage of 128,472. A total of $27,821,120 was paid for the ships, which ranged in weight from 5,350 to 9,600 tons each. Prices paid per ton were from $210 to $225. Six ships were bought by one company, four by another, and two each by four concerns. One buyer took a single ship. All of the vessels will fly the flag of the United States. The Shipping Board has disposed of 332,045 dead-weight tons of ships for a total of $51,856,620 since the armistice was signed.

**This Picture Shows One of the Concrete Chutes Used to Fill a Mammoth Arch Form in Constructing a Los Angeles Theater Building**

## MAMMOTH CONCRETE ARCH IN COSTLY THEATER

Notable not only as one of the most beautiful and expensive structures of its kind in this country, but as one in which for the first time a concrete arch, such as is used in bridge construction, supports the balcony of a theater, a 12-story office and theater building recently was completed in Los Angeles, Calif., at a cost of $1,000,000. There are no posts in the theater because of the arch, for which concrete was used when it was found impossible to obtain steel. The weight of the span is 9,000,000 lb. It is 12 ft. wide and 110 ft. long, and contains 180 steel rods. In pouring concrete into the forms for the arch, chutes made of steel concrete floor forms, overlapping in clapboard fashion, were used. This form of chute is said to be original with the Los Angeles builders. Extremely elaborate are the decorations of the theater, both interior and exterior. Carved wood is conspicuous in the interior decoration scheme. Another feature is the projection room, in which are placed the moving-picture machines and spotlights. This is built of concrete, and placed so as not to obstruct the view of any person sitting back of it. Steel and asbestos doors to this room lessen the fire danger. Steel was used in the construction of the office building.

One of the features of the theater is a great jeweled dome, so placed in the ceiling as to appear to be suspended in

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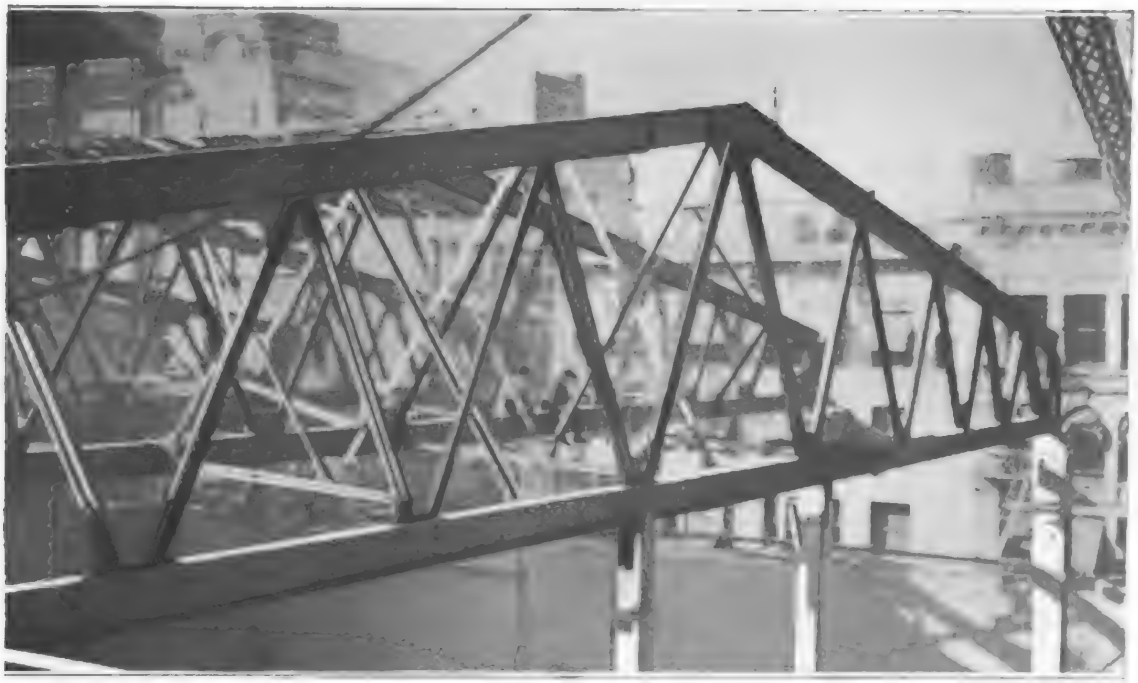
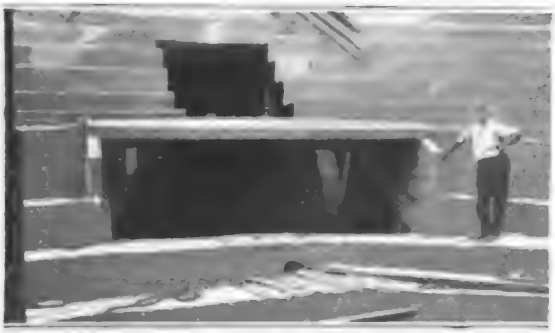


How the Roof of the Million-Dollar Theater was Erected: The Lower Girder of This Steel Roof Member Is 108 Feet Long. Cut in Half, It was Laid on Three Half-Inch Steel Cables, Strung between Concrete Pillars, and Then Joined into a Solid Piece. Afterwards the Upper Parts of the Support were Fastened on Top of the Girder, Making a Construction Strong Enough to Hold the Roof



To the Left Is Shown the Fireproof Projecting Room, Built in the Concrete Arch Which Forms the Theater Balcony. Steel and Asbestos Doors Protect the Audience from Fires or Explosions in This Room. It is Placed So That It does Not Obstruct the View of Those Sitting behind It. The Room is Ventilated by a Flue, Which Also Serves to Carry Away the Fumes Which Result from Heating the Film in the Projecting Machine

Form into Which 1,620,000 Pounds of Concrete was Poured to Make the Self-Supporting Balcony of the Los Angeles Theater: An Idea of the Amount of Steel Used for Reinforcing the Great Arch can be Obtained by Studying the Interior of the Form. Completed, the Balcony Weighed 9,000,000 Pounds. So Far As is Known, This Is The First Use of a Reinforced-Concrete Arch of Such Size in Building Construction



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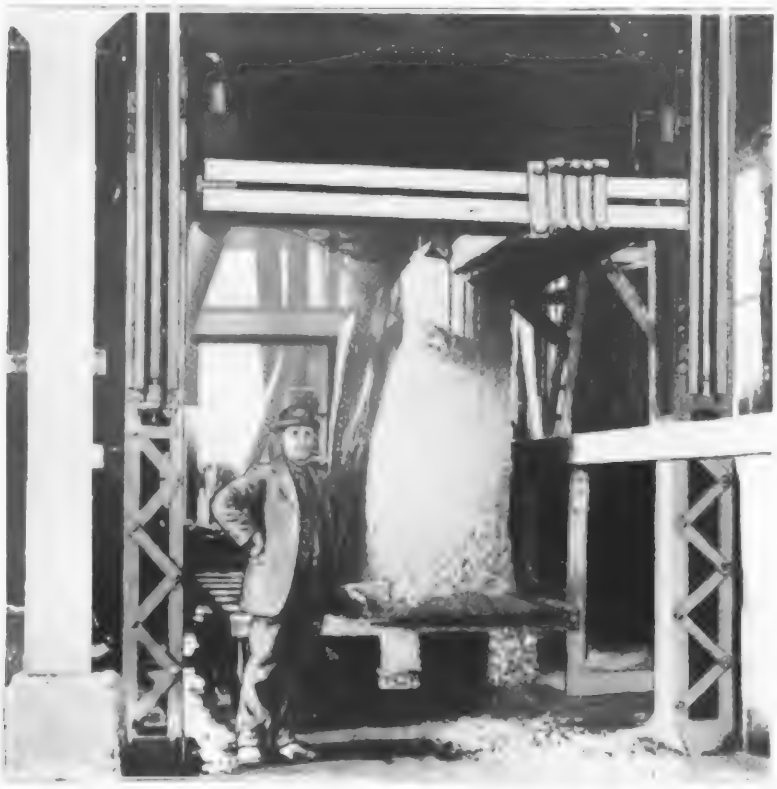
## MODERN STONECUTTER SLICES GRANITE LIKE CHEESE

The process of dividing the rough blocks of quarried stone into the smaller slabs of commerce is sometimes called "sawing." The term is descriptive in only a limited sense, however, as the thin-steel cutting blades are smooth and not provided with teeth. In place of teeth, sharp particles of sand or some other abrasive are fed from upper reservoirs to the edges of the moving blades. The process is thus an abrading and not a cutting one as might be expected.



**Streams of Sand and Water are Fed to the Smooth Steel Blades as They Move Back and Forth through the Great Block of Stone. The Blades Thus "Rub" Their Way through the Hardest Material the Quarry Yields**

## MILK DRINKING IN FACTORY BRINGS GOOD RESULTS

Milk drinking has increased the efficiency and improved the morale of employes in an Illinois factory to such an extent that milk venders are allowed to go through the plant twice daily to sell to the workers, many of whom buy a pint at each visit. Food specialists recommend milk as a refreshing and nourishing liquid food, and efforts are being made to popularize its use.

## AMERICA'S PEACE-TIME NAVY NOW IN THREE FLEETS

America's great navy has been divided into three parts. Concentrations of hostile purpose are now over, and the ponderous games of war are to be played only in the spirit of competitive sportsmanship. The encouragement of that spirit was, indeed, a major consideration in the reorganization of the fleets, whose great divisions, naturally, are the Atlantic and Pacific. Practically equal in strength, each of these fleets has four divisions of battleships, two of cruisers, eighteen of destroyers, and two of mine layers; but the Atlantic fleet retains three divisions of submarines, while the Pacific gets two. The third fleet, the Asiatic, is composed of such ships as are needed to preserve American interests in that quarter. In emergency, it is estimated that the two main fleets could be combined, ready for hostilities, within two weeks, while at least once a year they will meet as rivals in endurance and engineering tests, and in the greatest sham-battle engagements ever staged on the high seas.

## WASTE COAL-MINE SILT NOW WORKED FOR FUEL

Coal mining brings to the surface a number of materials besides coal. The process of putting the combustible mineral in shape for market separates from it a great quantity of sand, mud, and slate. This silt is either carted away or accumulates about the mines in huge piles of waste. But many a waste pile has been made to pay a profit, and the searching eye of war conservation soon discovered particles of good coal glistening in the hills of silt. At some of the mines in Pennsylvania, breaker plants have been erected whose sole duty is to reduce the acres of dump heaps as fast as carloads of the material can be brought

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**A Million Tons of Silt Occupied This Broad Expanse Until Recently, but Now It is being Worked Over for the Fine Coal It Contains. The Small Picture Shows a Silting Plant in Operation, Separating the Earth and Slate from the Coal**

to them. Jiggers wash away the earthy part, and what remains, like gold dust in the miner's pan, is a fine coal that finds a ready market in these days of fuel demand. Some of the mine companies have carried the cleaning-up process so far that the children of their employes now romp over playgrounds where million-ton silt deposits formerly rested undisturbed.

## BOLSHEVIST PAY-ROLL PLAN FAILS IN THEATER

Of the many queer tales that have come out of chaotic Russia since the overthrow of the czar, perhaps none shows more clearly how unsatisfactory applied bolshevism has proved than the story of the Moscow opera house where the radical principles were put to test. The soviet government appropriated $100,000 for the theater, with the provision that equal salaries be paid to all persons connected with it. A leading tenor protested against receiving the same pay as a stage hand, and declared that he would rather sell programs than sing, if the wages were the same in each case. Not until the bolshevist pay-roll system had been abandoned did the tenor return to the stage, and no attempt has been made since to experiment along that line.

## BEET SUGAR BY-PRODUCTS FATTEN BEEF CATTLE

Until it was discovered by California sugar-beet growers that beet tops and pulp are ideal food for beef cattle, these by-products of sugar refineries were allowed to go to waste. Now the growers not only produce beets, but they raise cattle as well. Narrow-gauge railroads run from the sugar plants to the feeding pens, and the tops and pulp are hauled to the animals in dump cars, from which they are transferred to feeding racks on both sides of the tracks.

**Great Herds of Beef Cattle are Fattened for Market on Sugar-Beet Tops and Pulp, Refinery By-Products, in California. The Provender is Hauled to the Feeding Pens in Dump Cars Running on Narrow-Gauge Railroads**

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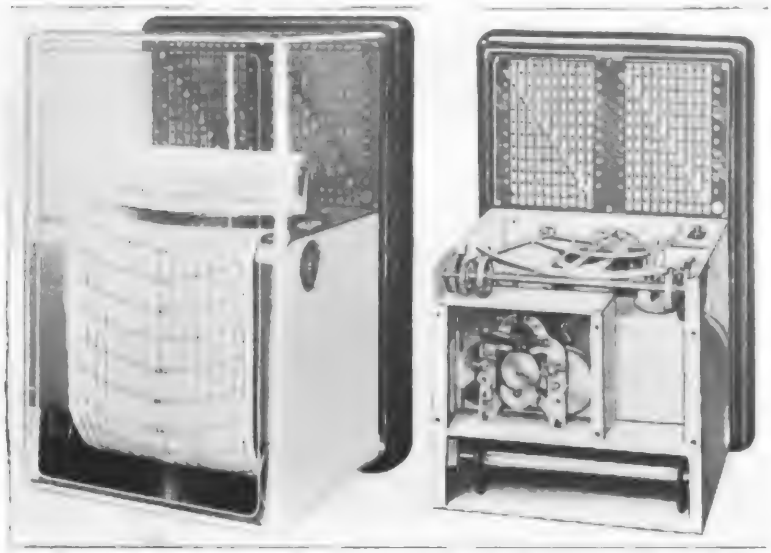
## RECORDS OF TEN FURNACES KEPT BY ONE PYROMETER

An automatic pyrometer may now be had which records continuously the temperatures of 10 furnaces. Each of the 10 thermocouples is switched on once every 10 minutes for a period of one minute. During this period a stylus prints in red ink three readings on the green chart, these readings serving to indicate whether the temperature in question is rising or falling. At the expiration of this period the chart is slightly advanced, the next thermocouple switched in, and three more readings made. Thus 10 minutes elapse between two consecutive readings on any given furnace. If less than 10 furnaces are employed, however, the interval may be reduced by proper arrangement of the plugs on the switchboard. If only one furnace is plugged in, the readings are continuous with 20-second intervals.



This Multiple Registering Pyrometer will Keep a Continuous Record of the Temperatures in 10 Furnaces. At the Right is Shown the Clockwork Make-and-Break Mechanism, with Needle for Indenting Chart

## SEAPORT FOR SWITZERLAND PROPOSED BY ITALIAN

A seaport for Switzerland in the Venice Lagoon, near Chioggia, Italy, has been proposed by the Italian chief inspector of public works. An excellent harbor already exists at the location, and if warehouses, railroads, and docks were built, an outlet to the Adriatic Sea would be provided for the inland republic. It is estimated that all necessary improvements could be completed within a year.

## AERIAL TOURISTS TO JOURNEY IN SQUADRON FORMATION

The Aerial League of America will this summer begin its "pioneer airplane tours," which resemble in purpose and plan the famous Glidden automobile tours of the past. The league hopes to interest the general public in this way, and to help the government dispose of surplus military and naval airplanes and equipment. Plans and itineraries have already been completed for four types of tours. The one-day tour will interest airmen who can spare only one day a week. The week-end tour will consume two or three days. The vacation-week tour will last a week, while the last class will include tours lasting 10 days to two weeks. The aerial tourists will travel in squadron formation, each group under a single commander. They will cover an average of only 250 miles each day, affording plenty of time for tennis, golf, or other diversions, at the scheduled stops. Mechanics meanwhile will fill emptied tanks and make necessary repairs.

## PORTABLE THERAPEUTIC OVEN IS QUICK CURE FOR ILLS

Mysterious though the term may sound, "thermotherapy" means merely the treatment of human ills by heat; and very efficacious the method has proven for sprains, wounds and rheumatic ailments. A college director of athletics has devised a portable therapeutic oven in compact form, equipped with electric lamps for the heat, and a spray for medicated lotions. The whole oven is set over the affected part and the liniment sprayed by compressed air from a small pump, while the glowing lamps bake out the sufferer's pains.

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## FLOOR ADDED TO BUILDING WHEN ROOF IS RAISED

Another floor was added to a 10-story brick building in an Ohio city recently by raising the roof of the structure and inserting material to support it at this greater height. Above the tenth floor of the building, which is 45 ft. wide and 100 ft. long, formerly was a low-ceilinged attic, lighted by small windows. When it was decided to make this attic a regulation floor, the walls were split on a line with the tops of the windows, and all above that was lifted by jacks. Thirty-five of these were used, operated simultaneously by as many men. It required a day and a half to raise the roof 4 ft. As the roof rose, steel building material was put in, inch by inch, and the brick walls were built in soon afterward. Special sliding joints allowed water and steam pipes to extend with the elevation of the upper part of the structure. The tenants of the building were not disturbed by the work, even those on the tenth floor going about their tasks as usual while the jacks were being turned. The new floor is now in use.

A 10-Story was Made an 11-Story Structure by Raising the Roof and Putting in Material to Support It at the Higher Level. Thirty-Five Jacks Did the Work in a Day and a Half

## NATURE VENTILATES MINE WITH SINGLE SHAFT

Nature, with only a little guidance by man, ventilates a small Nevada mine as efficiently as complicated power machines furnish fresh air to the larger mines, and at no cost since the installation of the simple apparatus. This mine has a single shaft, which of course does not favor the circulation of air. An air duct of boards, extending from the mouth of the shaft to the bottom of the mine, was put in by the owner, who then attached to this a piece of canvas, shaped like half of a funnel. The open side of the canvas is kept turned windward, catching and directing air currents into the duct, which carries the breeze to the bottom of the mine. The cost was insignificant.

The Canvas Half Funnel, Installed at a Nevada Mine, Catches the Winds and a Wooden Duct Carries the Air to the Bottom of the Shaft

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## RAILROAD RUNS TRAILER CAR FOR SPORTSMEN'S BENEFIT

A trailer car, designed and run especially for the accommodation and convenience of sportsmen, is a peculiar feature of railroad operation in the valley of the Hood River, northwestern Oregon. The car is sidetracked in the woods and used as a camp by parties of hunters and fishermen visiting the upper valley, in the vicinity of Mt. Hood, thus eliminating the tent problem and providing excellent sleeping quarters. Being lightly constructed, it adds little to the haul, yet its curtained sides afford ample protection to its patrons, who would scorn luxury.

**Trailer Car for Sportsmen, an Odd Feature of an Oregon Railway Line: The Car is Sidetracked and Used as a Sleeping Tent by Hunting and Fishing Patrons of the Road, Who, by Dropping the Side Curtains, are Protected Even from Storm**

## CAMP GRANT SITE BOUGHT BY WAR DEPARTMENT

Four thousand acres of land in Winnebago County, Ill., on which stand the buildings of Camp Grant, one of the larger national army cantonments, have been purchased by the War Department to be used as a permanent military reservation. A total of $800,000 was paid for the tract, the price per acre ranging from $150 to $350. When the United States entered the war, the land was leased from the owners, and the decision to purchase it was not reached until the mobilization center was designated as one of 14 such camps to continue indefinitely as army posts. Most of the land was bought at a price set by agreement between the owners and representatives of the War Department, but in a few instances condemnation proceedings were necessary before the land could be transferred to the government.

¶The government realized only 12 per cent of its original expenditure in the recent sale of 2,716 biplanes and 4,608 airplane motors to a private corporation.

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**TRANSATLANTIC FLIGHT ENDS IN IRISH BOG**

THIS is the transatlantic Vickers-Vimy bomber exactly as it nosed into the spongy bog at Clifden, on the completion of its 1,950 mile flight from Newfoundland. The condition of the plane explains why Alcock and Brown did not continue the flight to London, as planned. Captain Alcock is said to have admitted that he chose for a landing field "the softest spot in Ireland." The plane was later dismantled after identification of the seals by officials of the supervising aero club.

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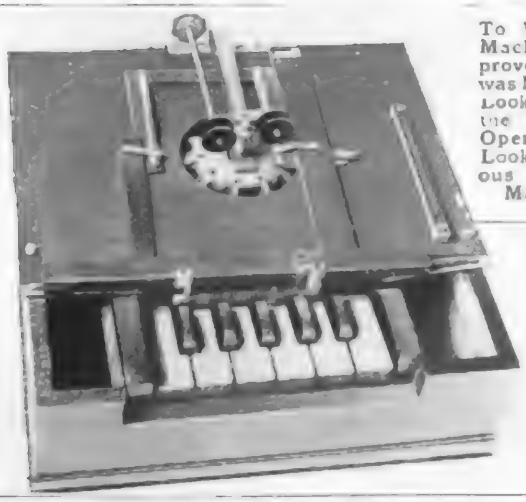
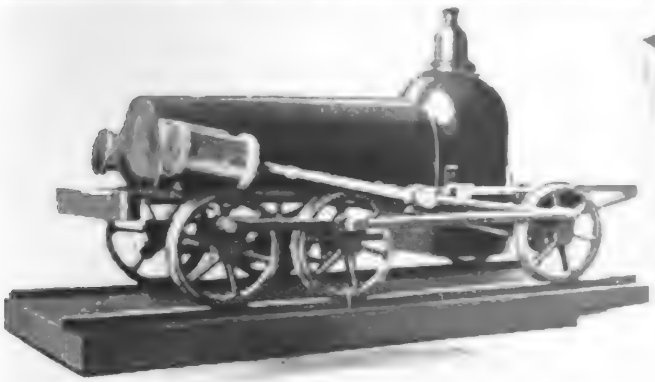


To What Extent Sewing Machines have been Improved Since the First One was Made can be Judged by Looking at the Picture on the Right. This Crank-Operated Mechanism was Looked Upon As a Marvelous Invention When It Made Its Initial Bow

From the Crude Machine Shown Above Grew an Office Device without Which Modern Business would be Lost. It Resembles a Toy Piano, but Is an Early-Model Typewriter



**Some of the Features of Modern Locomotives can be Seen in the Model of a Pioneer Railroad Engine Illustrated Above, but the Pioneer Probably Had Little Speed or Endurance. Eli Whitney's First Cotton Gin, at the Right, Is Not an Impressive-Looking Machine**

## MODELS SHOW PROGRESS MADE IN MECHANICS

People of today, viewing prototypes of machines in common use in everyday modern life, found themselves puzzled when they attempted to identify first and early models in a recent exhibition at Washington, D. C. One of the most puzzling of these models was that of one of the early typewriters, which resembles a child's piano more than a writing machine. It has but 11 keys. Other models shown included Eli Whitney's original conception of his famous cotton gin, an early type of the Baldwin locomotive, and one of the first sewing machines patented in this country.

¶Life preservers of stamped copper are said to be more buoyant and much more durable than the conventional cork and canvas form.

## CLAMP FOR BALL RACES IS NEW GARAGE TOOL

Well-equipped garages are often called upon to handle such small and accurately finished parts as the ball races of generator and motor bearings. A new puller clamp designed for this work, used in connection with a 20-ton press, consists of two heavy side brackets supporting a pair of spring-steel plates, with notches of graded sizes in their adjacent edges. Adjusting thumbscrews in the brackets adapt the clamp to work of varied dimensions, the notched plates locking securely into the ball-race groove. The clamp is made in two sizes, with 9 or 16-in. plates.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*

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## WING FENCES PROTECT POWER HOUSE FROM ROCK SLIDES

A power house in the cañon of the Tuolumne River, California, was constantly menaced by rock slides, loosened by operations at the top, and finally a tool shed was practically demolished by a rolling bowlder. To protect the plant, wing fences of heavy timber have been built along the line of the penstock up the steep cañon wall, forming V-shaped guards calculated to divert any incipient avalanches harmlessly to one side. The fences are made of rough logs, fastened with old cable, and supported by stout posts.

**The Wing Fences Seen against the Side of the Cañon are Built of Heavy Timber, Their Purpose being to Protect the Power House from Slides of Rock and Rolling Bowlders**

## PRIZE OFFERED FOR ESSAY ON FOREIGN RELATIONS

Plans for controlling the foreign relations of the United States, with special attention to the rights, duties, and responsibilities of the president, congress, and the bench, will be outlined in essays to be submitted to the American Philosophical Society, Philadelphia, for a prize of $2,000 in gold. Under the rules of the contest the essays are to be less than 1,000 words in length, but may be written in any language, provided they are accompanied by English translations. Essayists will identify their work by pen names or mottoes, their proper names to be sent in sealed envelopes which will not be opened until the judges of the contest, five in number, have chosen the winning essay. Contestants may submit essays at any time before the end of 1920. The award will be made from the Henry M. Phillips Prize Fund, presented to the society by a Philadelphia woman in honor of the memory of her brother.

## BIG ROTARY DREDGE CUTTER REPAIRED BY WELDING

After long service in chewing up the bottom of the Columbia River, to facilitate dredging operations, the massive blades of a 2½-ton revolving dredge cutter were found recently to be practically worn through. The unwieldy cutter was operated upon, and a 26-in. section cut from one blade. A new steel blade, 11 in. wide and 3½ in. thick at the back edge, was then welded in place by the thermit process. The first finished, the second blade was repaired in the same way, and so on around the circle of six. In this work 1,120 lb. of steel was used, and something less than 800 lb. of thermit.

**Dredge Cutter Head Repaired, by Thermit Welding, with Six New Blades, Each 26 Inches Long, 11 Inches Wide, and 3½ Inches Thick**

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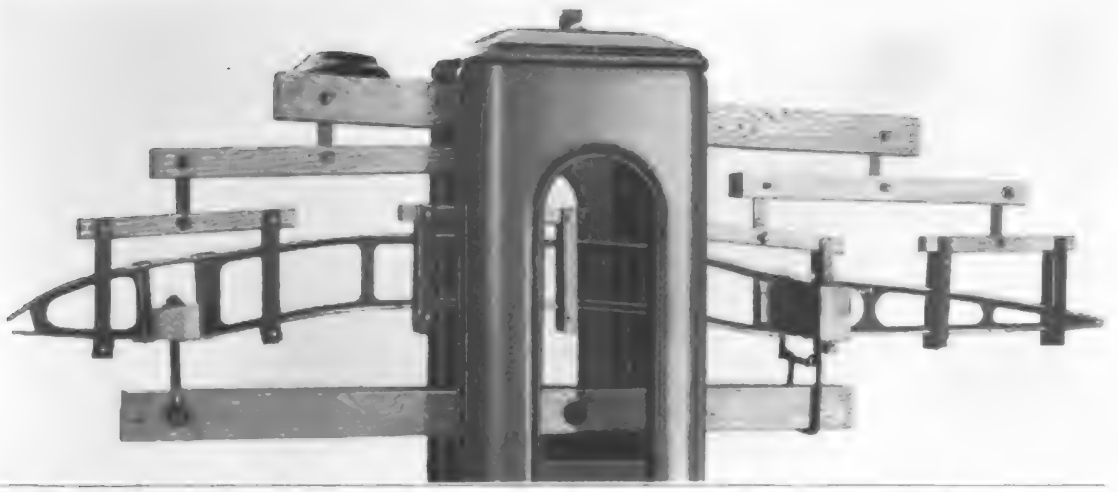


The Machine for Testing Airplane Wing Ribs Distributes the Stresses Exactly as the Rib Receives Them in Flight, by an Arrangement of Levers Somewhat Reminiscent of the Evener on a Horse-Drawn Vehicle

# A WOOD THAT IS STRONGER THAN STEEL

## How Waterproof Plywood, Discovered by Yankee Experts, Revolutionized Airplane Construction, and How It will Enter into Post-War Industry

By E. T. BRONSDON

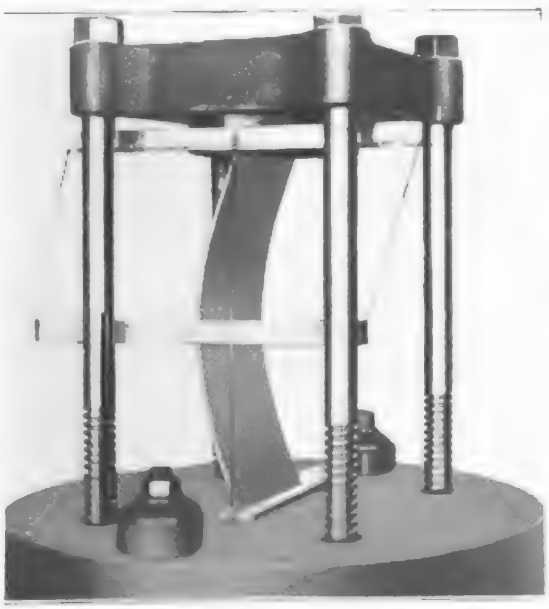
"SEE this toothpick?"

The Forest Products Laboratory expert who was starting to demonstrate plywood to me extracted a small polished wooden sliver from one of his vest pockets.

"Now, you wouldn't believe that in one way, weight for weight considered, this is stronger than a steel bar, would you?"

I admitted that it sounded improbable.

He did not bother to argue. Adjusting a fine balance scale, he placed the toothpick on one of the pans, and brought the arms to horizontal by laying a 3-in. length of light steel wire on the other pan. The weights were equal, and the lengths the same.



The Panel of Plywood being Tested in the Machine Bends, of Course, but It must Not Break under the Maximum Stress, Which Is a Great Deal Higher than It would Ever be Called Upon to Carry in Practice

Then in a small testing machine he proceeded to apply tension to the steel wire. At 29 lb. the steel gave way. Then he fixed the toothpick in place, taking care not to crush the wood fibers. The increasing tension tended to pull the toothpick apart in the middle—the grain, of course, running lengthwise. At 74 lb. the toothpick failed.

He looked disappointed, and immediately offered excuses. The toothpick should have withstood 100 lb. or more, but evidently the testing machine had harmed its resistance. Also, a sliver of yellow poplar, Sitka spruce, or Douglas fir would do better than white pine. . . .

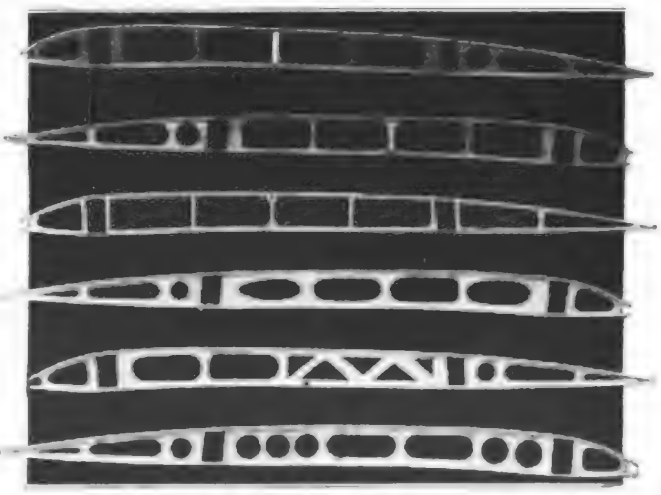
I was willing to take his word for it now, however. He went on to tell me how the denser woods all could beat steel in this test by from 300 to 600 per cent, but that when tested across the grain, the best of wood showed only from one-fourth to one-half the strength of steel. "That's why plywood was invented," he commented.

Plywood essentially is a piece of wood of any variety, cut by a machine into thin panels, and glued together again in such manner that the grain of one panel runs

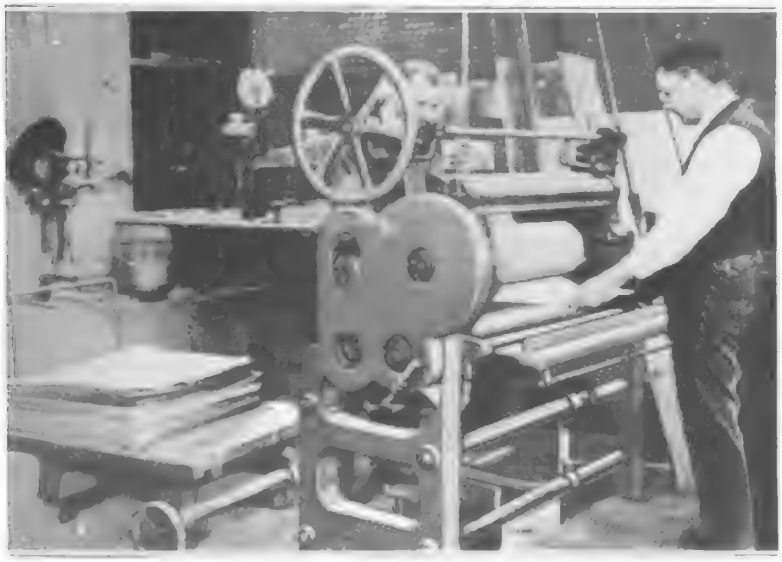


*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*

at right angles to the grain of the two adjacent panels. In order to understand this perfectly, let us suppose that a 1-in. square of Georgia pine, ½ in. thick, be cut into four 1-in. panels each ⅛ in. in thickness. Let us place the first on the table before us so that the grain runs north and south. On top of this let us glue the second panel, the grain running east and west. The third follows, grain north and south, while the fourth is east and west again. The completed article is a small section of a plywood panel, the strength of which, in two planes, greatly exceeds that of steel. With some woods, by combining cuts, it is even possible to secure greater resistance to stress in all three planes than steel affords, though it is rarely necessary to go so far. Ordinarily wood used in construction, as for airplane wing ribs, engine bearers, and the like, is not required to withstand severe stresses in more than two of the three planes. What the development of plywood has meant to airplane construction is well illustrated by the instance of the De Haviland-4. Before plywood, the best airplane wing rib developed weighed 7.95 oz., and was capable of sustaining a load of only 91 lb. The first plywood wing rib made by the Forest Products Laboratory weighed 6.93 oz., and sustained a load of 109 lb. Since then, although a wire-strengthened rib was invented by these experts capable of sustaining 254 lb. with a total weight of 6.30 oz., the plywood rib has improved still further. The rib last used on the De Haviland weighed 5.12 oz., and could carry 274 lb.; this was a clear "edge" for plywood of 32.75 per cent in strength per ounce of weight. Only an airman, trusting his life continually to the wings of his cloud steed, can appreciate fully what one-third more strength for the same weight means to him.



**Various Forms of Airplane Wing Ribs have been Constructed of Plywood, with Constant Improvement. All of Them Are Stronger Than Steel, the One Braced with Wire Supporting 254 Pounds and Weighing Only 6.3 Ounces**



**The Veneer Cores for the Plywood are Passed between Two Heavy Rollers, the Lower of Which Revolves in a Bath of Special Glue**

It would be of interest only to an aviation fan to detail all the places in an airplane where plywood now is used. Suffice it to say, that in the best machines, now practically every part of the fuselage subject to strain, and several other parts, are made from plywood. So admirably has this construction material proved, that forest-products experts have started extensive experiments on the wings themselves, of which it just now is permissible to speak.

Heretofore varnished linen has been practically the only material with which

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wings have been covered. At the laboratory, however, a process was invented late in 1918 of making plywood so thin as to be suited for the same purpose.

In doing this, the panels are cut .01 in. in thickness, in squares of 3-ft. length. Under any process of gluing used up to 1918, it was impossible to make sheets of this thickness stick together without disintegrating. The glue soaked through, causing warping and other troubles. The new gluing means consists in coating thin sheets of tissue paper with blood glue, letting it dry, and then applying the plywood panels to each side in a steam-heated press. The resultant material, 1/100 in. thick, is surprisingly strong.

This extremely thin plywood actually was tested on airplane wings built especially for the purpose. Though with its first development it did not seem sufficiently superior to linen to cause an immediate displacement of the latter, it nevertheless gives between six and eight per cent added lifting power for the reason that the "flap" of the cloth is eliminated entirely. Weight for weight, its strength is approximately the same; in the future it is quite likely that all wings may be covered with this material.

When plywood was first thought of in connection with airplanes, an apparently insurmountable difficulty presented itself. A machine that had to be out in all weathers and spend much of its time in dense fog and in thick clouds—often approaching 100-per-cent humidity for long periods—must not be held together in any way by glue that water could dissolve. Though several so-called "waterproof" glues were on the market, not one of them showed satisfactory strength when subjected to wetting. Also, these glues were secret preparations, for which the government would have to pay a high premium.

The laboratory experts, however, busied themselves with the problem and evolved two new glues, one made from the blood of animals and one derived from casein—obtained from milk. Panels were glued together with these and tested.

The plywood test pieces were boiled in water for eight hours. At the expiration of this time none of the pieces showed any separation of the plies. Soaking in cold water for 10 days gave the same result.

Only Test Blocks of Plywood are Finished in This Machine, the Glue being Dried under Pressure of the Screws

The blocks were tested in a shearing machine, which applied force in such a manner as to push one ply from another. In this test a pressure of from 250 to 700 lb. to the square inch of glue surface was required to separate the layers, so strong were the new glues, and even then it was, in most cases, not the glue, but the wood fibers themselves, that gave way. After boiling the test pieces for eight hours, the average pressure exerted amounted to 180 lb., and after soaking them for 10 days the plies defied pressure up to 200 lb. Since the specifications for airplane plywood demanded only that the material exhibit a strength sufficient to withstand a pressure of 150 lb. to the square inch when dry, the new glues were accepted with acclaim. Also, as an added feature, it was demonstrated that, after drying again, the blood glue regained all but six per cent of its original strength, while the casein glue lost only 18 per cent in the tests, which, of course, were much more severe than any conditions a

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service airplane would ever be called upon to withstand.

In the case of thicker joints—blood glue is used only for veneer, where it can

The Board being Spread with Glue in the Wringer-like Machine is to Form One Layer of a Piece of Heavy Plywood

be pressed by steam-heated plates—the new casein glue exhibited remarkable strength. With blocks of maple having the grain running in the same direction, a shearing strength of from 2,000 to 2,500 lb. to the square inch was found to be common.

These new glues saved the government over $6,000,000 in the construction of plywood alone. As is the case with all the discoveries of the Forest Products Laboratory not actually needed exclusively for war, the formulas are at the service of American industry. Any manufacturer or private user of glues who wishes to manufacture either of these glues is at liberty to do so. The laboratory will give advice in this respect, and extend experimental help if this is necessary.

An Ingenious Machine for Taping Veneer Joints, Enabling the Use of Small Strips in Making Sheets for Gluing

In considering the application of this new waterproof glue and plywood to industry in our reconstruction period, it becomes evident that an entirely new field has opened for progressive manufacturers of wood articles. Who, till now, has put on the market a standard door that will not warp? Plywood panels cannot warp after they are finished, for one ply holds the next rigidly. What manufacturer has got out a table or chair with glued joints that will not fall to pieces in a damp atmosphere? Furniture made with casein glue will hold together far better.

For cabinetmakers and manufacturers of wall coverings another entirely new aspect appears. The ⅛₀-in. plywood used as covering for airplane wings naturally retains every beauty and quality of the wood from which it is made. It is capable, in the case of mahogany, Circassian walnut, and other fine varieties, of taking just as high a polish as the thicker veneers used by the trade until this year. Ponder this: The thin plywood will not warp or peel; it can be manufactured from the finest walnut at a total cost of less than three cents a square foot, while for cheaper woods the cost runs in the neighborhood of one cent a foot. This is between one-third and one-tenth the cost of ordinary veneers used for cabinetmaking or for wall paneling. It is so inexpensive that the finished product could be retailed at a price within the reach of the great majority of house owners. Thousands of them, now content with florid wall papers, would use the new plywood paneling. What manufacturer wants the chance to be first in this field?

## ANGLE FOR LOST ARTICLES IN SUBWAY VENTILATORS

Retrieving articles lost when dropped through the sidewalk gratings of subway ventilators is a form of dry-land fishing that is popular with many small boys and a few grown-ups in a large eastern city. The tackle used by the pioneers of the game, the small boys, consists of a rock tied on the end of a string and rendered

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**Fishing on Dry Land As It is Done in a Large Eastern City: Small Boys Angle for Articles Dropped through the Sidewalk Gratings of Subway Ventilators, Using Gum-Coated Rocks Tied on Strings. At the Left is Depicted What was Caught by a Magnet and a Hook. In the Center Are Three Fishermen, and at the Right Are Some of the Trinkets They have Retrieved**

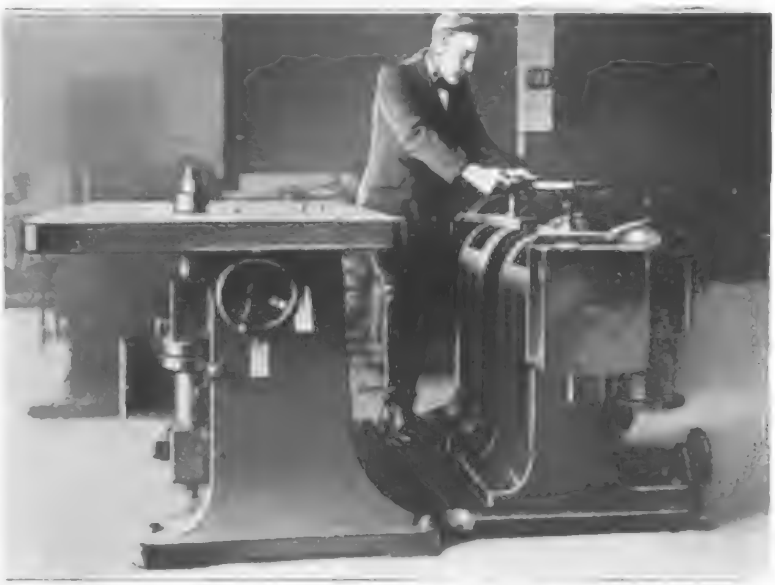
adhesive by the application of a bit of chewing gum. Lowered through the gratings and properly directed, this tackle often brings up coins, fountain pens, knives, nail scissors, jewelry, and other small articles. A systematic probing of the ventilators is conducted by a man who uses a jointed pole with sticky end.

## CHINESE CARAVANS VANISH IN FAVOR OF TRUCKS

Four thousand picturesque camels and their 1,000 drivers are to be succeeded by 30 businesslike American trucks for the transportation of freight between Tientsin, China, and Kulja, Eastern Turkestan, a distance of approximately 2,000 miles. An agricultural colonization company is responsible for the contemplated change. Farm products will be carried on the return trip. Each camel of the caravans now traveling the route is capable of carrying only 200 lb. of freight, while each truck, equipped with a trailer, will be able to transport six tons. Traveling at the rate of 20 miles a day, the animals require about six months for the round trip. The trucks are expected to cover the same distance in 30 days. Equipment for two machine shops will accompany the trucks. One shop will be located in Tientsin and the other in Kulja. Stations for supplying fuel, water, and lubricants will be established along that part of the route which traverses arid territory.

## EACH SPINDLE ON NEW SHAPER DRIVEN DIRECT FROM MOTOR

Machines that are easily installed and occupy relatively little space are welcomed in every shop. And such are the merits of a new shaper which mounts, on ball-bearings, two spindles, each driven directly by its own electric motor. This arrangement allows the spindles to work independently, and eliminates line shaft, countershaft, and the other elements of overhead power transmission.



**The Demonstrator is Shown at the Adjusting Handwheel of One of the Two Motors Which Drive the Spindles of the Shaper at the Left. The Direct Power Transmission Means Economy in Shop Space**

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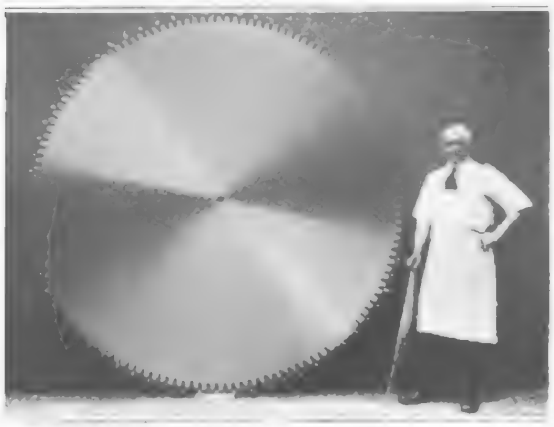
## LARGEST CIRCULAR SAW HAS INSERTED TEETH

Replaceable teeth are a feature of what is declared to be the largest circular saw ever put into actual operation. When



This Is the Largest Saw Ever Put to Practical Use. Its Teeth are Inserted in the Big Disk, and When Worn or Broken, may be Replaced

broken or worn, the teeth may be removed from the edge of the steel disk, in which they are inserted, and new teeth substituted. There are 140 of these teeth. In diameter, the great saw is 96 in., and its weight is 594 lb. A sawmill of the Northwest is using the saw, which was made in the East.

## HONOR-SYSTEM CANTEEN TEST FOR STUDENTS

Not a clerk is in sight in the coöperative store of an eastern university. Student customers not only select their purchases, but they wait on themselves, make change

The Man in the Picture Is Customer, Clerk, and Cashier in This Honor-System Canteen of an Eastern University

in the cash register, and ring up the amount of the sale. All the manager of the store has to do is to replenish the stock and take care of the receipts at the end of each day. The canteen system was put into operation for the purpose of testing the honesty of the students and to democratize the school.

## FIRST TRANSATLANTIC FLIGHT RECORDED IN PICTURES

It is now learned that every item of the navy's transatlantic flight program was recorded in pictures for the archives of the department. The story begins with drawings, sketches, and photographs of the construction of the four NC planes, capped by trial flights and alterations at Rockaway Beach, L. I. Then come several thousand feet of motion-picture film and several hundred photographs showing scenes at Halifax, Trepassey, Ponta Delgada, Lisbon, and Plymouth. In addition, a navy airman with experience as a painter served as official artist for the undertaking. During a three weeks' stay at Ponta Delgada he painted in oil nearly a dozen dramatic incidents of the flight.

## PREVENTION OF EXPLOSIONS OBJECT OF CAMPAIGN

Stirred to greater efforts by numerous grave and costly disasters in grain mills, elevators, and similar plants, the Department of Agriculture has instituted a vigorous campaign which has as its object the prevention of grain-dust explosions. Danger from this source can be practically eliminated, government experts declare, by the employment of methods and devices that have been tested by the department. During the 18 months preceding the beginning of the campaign 39 persons were killed, 60 injured, and 2,500,000 bu. of grain and $8,000,000 worth of property were destroyed in six grain-dust explosions and the resultant fires.

## GRASS MOWING RACE ENDS ARGUMENTS OVER LAWNS

When it became impossible to decide by ordinary means which of two streets in an Ohio town had the better kept lawns, a grass-cutting contest was arranged between two teams, each representing one of the streets and composed

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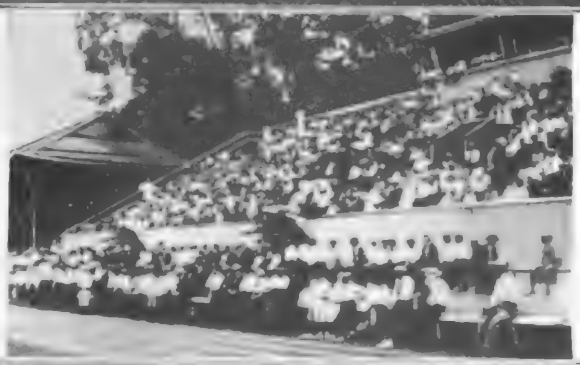
Above Is One of the Lawn-Mowing Teams. Its Members Wore Dark Trousers to Distinguish Them from Their Opponents



Many Neighbors and Friends of the Contestants, Not to Mention Members of Their Families, Watched the Lawn-Mowing Contest

Rival Neighborhoods in an Ohio City Decided to Settle the Question of Which Had the Better Kept Lawns by Holding a Lawn-Mowing Contest. Teams Representing Two Streets Took Part in the Unusual Race. In the Picture Above is Shown One of the Teams as It Looked Before Work was Begun

of men from many walks of life and of all ages. One team member was 82 years old. The contest was held on the athletic field of a large school. Areas of equal size were allotted the two teams for cutting with lawn mowers. At the report of a starter's pistol, the contestants began pushing their machines over the plots at top speed. Though one team finished eight minutes before its rival, the prize was awarded to the slower aggregation for neater work. The mayor of the city in which the contest was held presented the prize. Over 2,000 persons witnessed the contest.

## WHEAT DIRECT FROM HARVESTER TO MARKET

A Nebraska wheat farmer, striving to overcome a handicap of 18 miles to the railroad, almost succeeded in harvesting his crop directly into market. He employed a combination harvester and thresher, which delivered the threshed grain into a relay of wagons that moved along with the machine. When loaded, a wagon turned out to transfer its burden to a waiting motor truck, and an empty one took its place. The full truck raced away to the railroad and deposited its freight—grain that had been growing in the field only a few hours earlier. About 25 acres a day was harvested in this expeditious manner.

The Wagon at the Left Received Threshed Wheat as It Moved Alongside of the Machine, a Combination Harvester and Thresher. When Full, It Transferred Its Load to a Motor Truck and an Empty One Took Its Place

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine*

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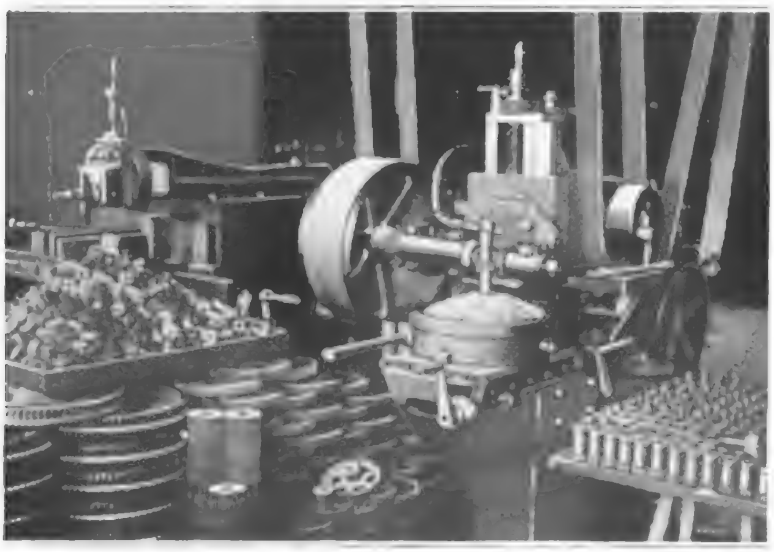
## MACHINE CUTS SPUR GEARS IN SINGLE OPERATION

Spur gears are cut in one continuous operation by a new machine, on which the spindle of the revolving hob may be set at any angle. In cutting spur gears, the spindle is adjusted so that the hob will cut across the face of the blank parallel with the axis of the gear. The hob is then fed downward, while the blank revolves. Several gears may be placed on the revolving worktable at one time.



Because of Its Adjustable Hob Spindle, This Machine may be Set to Cut Spur Gears. The Work is Accomplished in One Continuous Operation, and Several Gears may be Cut at One Time

## RARE ELEMENTS DISCOVERED SUITABLE FOR PAINTS

Paint pigments prepared from radium, tungsten, and other rare elements are recommended by a researcher as possessing high covering power and opaqueness when ground with oil. Selenites of lead and barium give fine, white pigments, while certain derivatives of beryllium and zirconium—more costly materials—yield an excellent product. Other elements suggested for paint making are selenium, molybdenum, titanium, vanadium, and uranium.

¶ Houses a mile away from the landing field near Baltimore, Md., were shaken when the navy dirigible "C-8" exploded not long ago, hurling many spectators 20 to 30 ft., and injuring 75 persons with patches of burning fabric.

## ANCIENT RACING REGULATION BARS SWIFT ANIMAL

Efforts are being made by certain members of the English Jockey Club, under the auspices of which England's classic races are run, for the amendment of an ancient rule of the organization which prohibits a horse from starting in a race if the animal has been sold by the person who made the entry, or if that person is dead. One of the swiftest horses in the history of racing was barred from participation in the Derby, St. Leger, and other important contests because of the death of its owner, an Englishman of royal blood, who had nominated it for these races. Although the new owner of the horse was willing to carry out the engagements made for the animal by the former owner, he was forced to run it only in less important events because of the archaic rule.

## PRACTICAL PLASTER BOAT EASY TO CONSTRUCT

Following in the wake of the concrete ship comes the plaster boat, the idea of a western inventor, who declares the construction not only practical, but of merit because such craft are quickly and easily built. Ordinary plaster, such as is used on the walls of buildings, is applied to the inside and outside of a boat-shaped frame to which has been nailed metal lath.

The Graceful Rowboat Shown Here was Made of Plaster, Which was Applied to a Frame of Wooden Strips Covered with Metal Lath

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Cinder-Handling Plant Installed in an Ohio Railroad Yard: The Inclined Trestles Serve Four Tracks, between Whose Rails Are Pits That Enable the Traveling Buckets to Receive the Locomotive Cinders, After Which They are Hoisted by Cables to the Storage Tower at the Right

When the plaster is dry the boat is ready for use. Air-tight compartments at each end of the boat prevent it from sinking, even if it is filled with water. A plaster boat, 14 ft. long, with walls ¾ in. thick, weighs 400 lb., and, according to the inventor, can be built in two days by one man.

## AIRPLANE TAXIS PERMITTED TO LAND IN PUBLIC PARK

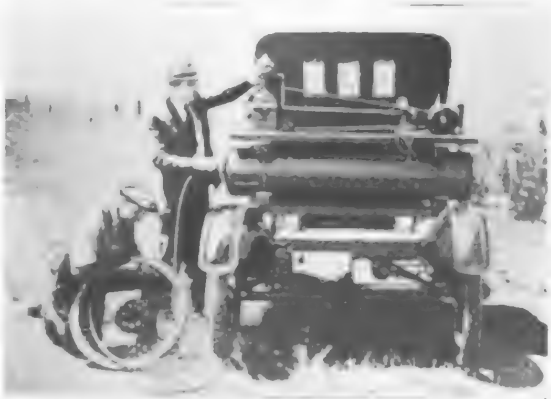
An aerial taxi company of Chicago recently petitioned the park board for a permit to take on passengers in Grant Park, which stretches between the down-town district and Lake Michigan. The commissioners refused to grant the permit, yet told the company to use the park for this purpose until notified to stop.

## MODERN PLANT FOR HANDLING LOCOMOTIVE CINDERS

Mechanical handling of locomotive cinders by a specially designed plant, recently installed, has added greatly to the operating efficiency of an Ohio railroad yard. From a concrete storage tower two diverging trestles incline downward, passing over four tracks. Under each track is a pit, 125 ft. or more in length, with rails at the bottom. Buckets running on these rails are readily placed under the locomotives, and then, loaded with cinders, rolled to the end of a trestle. Cables elevate them to the storage tank, where they are automatically dumped. Electric controls prevent overrunning of the trolleys. The storage tank dumps directly into cars beneath its hopper bottom.

## PORTABLE AIR COMPRESSOR AIDS MOTOR RACERS

The problem of getting air under pressure to the pits at an automobile or motorcycle race has been solved for one company by the use of an auto-mounted air compressor. The air tank is secured to the frame of a light truck, with the compressor and motor above it. The electric motor is usually operated by "plugging in" on a nearby 110-volt circuit; but if no current is available the motor may be run from the car's storage batteries. The outfit was used for the first time at a recent motorcycle race, when it enabled a rider to change a tire in 40 seconds.



This Electrically Operated Air Compressor Supplies Compressed Air for Tire Inflation at Motor Race Meets and Road Contests

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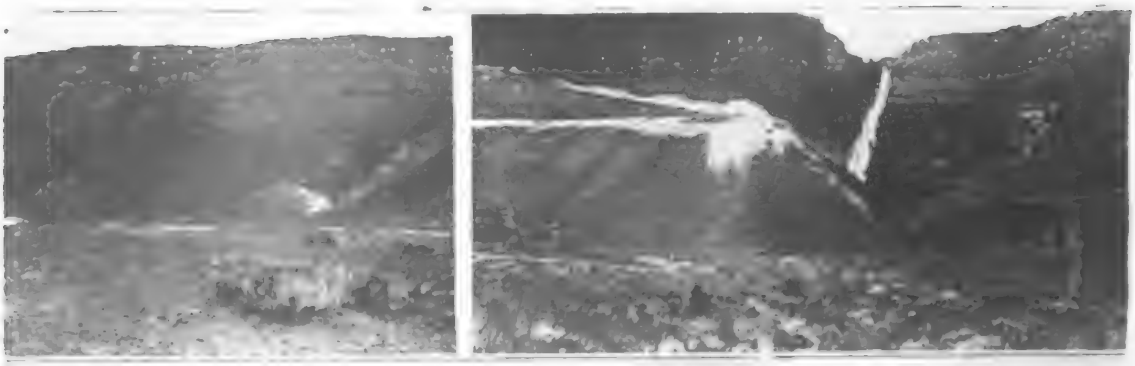

The Road Makes Its Sudden—and Not Entirely Safe—Turn at This Point to Avoid a Ducking in the Cold Water of the Cascade Beyond

In the Panorama of the Snake River's Beautiful Valley, Much of the Winding and Staggering Auto Trail to the Bottom Is Visible. In the Upper Corner is Pictured the Portion of the Cliff Where the Settler is Reported to Have First Lowered Himself, with Aid of Block and Tackle

## FIRE-OBSERVATION TOWER IS HIGH POINT ON LONG ISLAND

Because of the view to be obtained from its top, a steel observation tower at Selden, L. I., built by the conservation commission of the state of New York for forest-fire watchers, is extremely popular with persons who feel that such a view is worth a long climb. The tower is said to be the highest point on Long Island. It is 70 ft. high, and is located on the summit of a hill 333 ft. above sea level. The upper deck, which is glass-inclosed, is reached by steel stairs. Another tower of similar construction is located at Flanders, L. I. It is 47 ft. high.

## DROP ROAD DOWN AS ENTRANCE TO

There is a place in Idaho where fruit trees of wondrous productiveness grow out of the spaces between giant bowlders, and are irrigated from lakes that are named "blue" because they are blue, and not for the usual sentimental reasons. And the only entrance to this curious garden is down a tortuous, twisting trail where the auto driver's heart goes into his mouth as his gears go into "first." It is 800 ft., vertically, from the sagebrush prairie to the oasis. Travelers do not go vertically, of course, except the careless ones; but the angle of depression is sufficiently great, and the way sufficiently narrow and devious, for ample thrill.

The feat of dropping the road down the cañon side was undertaken by the people of Twin Falls, and the site is a little above the famous Shoshone Falls of the Snake River, and 3½ miles from town. A modern bridge of many piers crosses the half mile of river; but getting from the cañon rim to the bridge head is a trick for expert drivers. They look well to the brakes before starting, too, for some of the grades are so long and steep that they are needed all the way. Only a low stone wall guards the abyss, and turnout points are scarce. Once the road followed a ledge along the cliff, passing behind a silvery cascade whose spray, beautiful but wet, frequently deluged the bold traveler. But now the trail abruptly turns about be-

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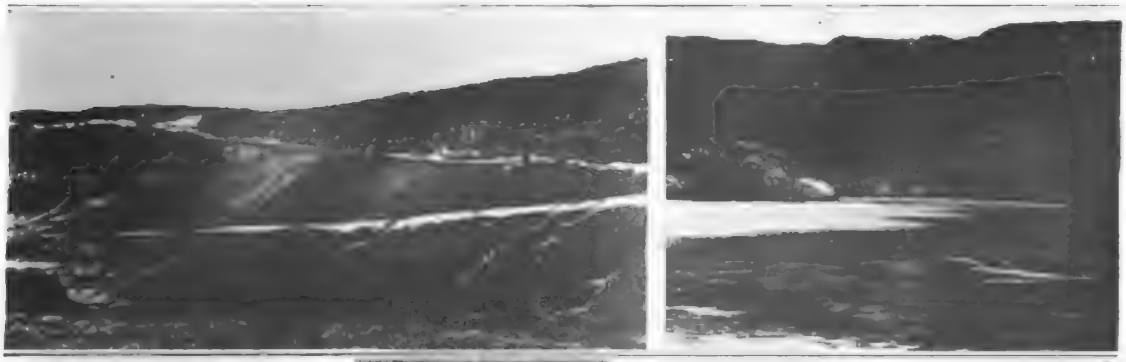


A Good View of the Road Down the Cañon Side, Both Above and Below the Point Where It Makes Its Quick Reversal of Direction

## CAÑON'S CLIFFS STRANGE GARDEN

fore it reaches the waterfall, and backs to another level. So sudden is the turn that the larger cars must back and fill to negotiate it. One driver backed clear off the precipice some time ago—and escaped with his life, though parts of the car might still be found. Many visitors prefer to walk.

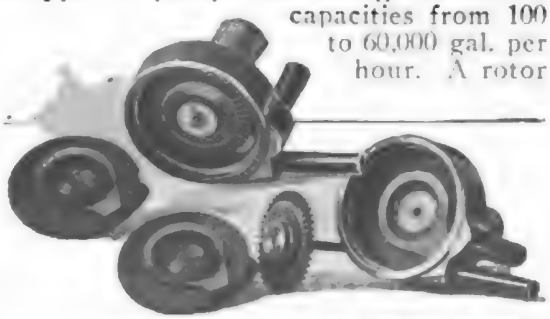
In spite of the tons of huge bowlders that clog their aisles, the orchards in the valley (whose owner "settled," it is said, with the aid of block and tackle) produce fruit of exceptional quality, and in early season because of the sheltered climate. Irrigating water is taken, by ditches and big iron pipes, from the Blue Lakes, and their outlet, Alpheus Creek. The bottom of these waters is lined with a deposit as blue as indigo; yet they are marvelously pure and clear. The lakes themselves are thought to be the outlet of Lost River, which disappears in the ground some distance away. Many of the streams in that strange valley appear only to vanish again; and Alpheus Creek itself might well be Coleridge's "Alph, the sacred river," which "ran, through caverns measureless to man, down to a sunless sea."

There are plans for making the treacherous trail a part of the state highway, and in that event the engineers say they can reduce the grade to a uniform eight per cent. Then it will be less interesting, perhaps, but a great deal safer, and so enjoyed by more visitors.

The Orchard Whose Trees Grow between Huge Bowlders, by Standing on Which the Fruit may be Picked without a Ladder; It Is of Unusual Quality: In the Upper Corner Is One of the Blue Lakes, the Sands of Its Bottom Coated with an Indigo Deposit, but Its Waters Pure and Clear

## SIMPLE PUMP OF NEW DESIGN HAS SINGLE MOVING PART

Extreme simplicity marks the design of a type of pump now being offered in capacities from 100 to 60,000 gal. per hour. A rotor



Above Is the Pump Assembled, with the End Plate Lying at the Left; Below, the Three Parts, End Plate, Rotor, and Case, are Separated

whose periphery carries a calculated number of radial vanes revolves in a case with an annular chamber, into which the intake and discharge pipes enter side by side with a dividing wall between them. The pump is not centrifugal, the rotor vanes merely impelling the water along the annular passage. There are no frictional contacts except at the bearings. The 100-gal. size is no larger than a watch.

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## BIRDS TRAVEL COMFORTABLY IN IMPROVED CAGE

The hardships of travel have been reduced to a minimum for live birds by a shipping cage invented by a Los Angeles dealer in feathered pets. It is almost impossible to place the box in any position except right side up, but if this should be done, several transverse perches and one longitudinal perch provide places for the occupants to stand in upright positions. Large, screened air vents are recessed so that the air supply cannot be shut off by the piling of other packages around and on top of the cage. Unspillable food and water containers assure these necessities to the winged travelers en route. The cage is painted a brilliant yellow, and is labeled "live birds" in large red letters on all sides.

## CLOCK OF AEROPLANE PARTS MADE BY NAVAL AIRMEN

A clock made from parts of an aeroplane by American sailors stationed at a naval aviation base in England was presented by them to an Englishwoman of the nobility as a Christmas gift. Mounted on a polished base is the piston of a Liberty motor, to which the timepiece is fastened. Near the top of the piston, and directly over the face of the clock, the word "Liberty" is engraved. Surmounting the whole is a metal eagle with outspread wings and a shield covering its body.

## RAILROAD USES GUNPOWDER TO OPERATE GUN HAMMER

Black gunpowder of the kind ordinarily used in sporting ammunition is employed as a timesaver in the shops of an eastern railroad for operating a gun hammer which removes obstinate nuts and bolts, breaks up iron or steel for scrapping, forces locomotive pistons that are bound by rust or corrosion, and breaks metal that has become cold in furnaces. A steel barrel, into which is fitted a plunger of the same material, is loaded with the powder, the charge varying with the nature of the work to be done. With the muzzle of the barrel about one inch from the object to be struck, the charge is set off. A strong quick blow by the plunger is the result. Several sizes of these gun hammers are used, the length and bore varying for different kinds of work.

## LARGE TYPEWRITTEN LETTER SENT TO CONVENTION

An invitation sent by an association of hotel keepers of Atlantic City, N. J., to a national convention of Rotarians in Salt Lake City, Utah, is stated to be the largest typewritten letter ever inscribed. It was written on a page 20 ft. long and 10 ft. wide by a gigantic typewriter, 21 ft. wide and 15 ft. high, which weighs 14 tons. An enlarged reproduction of the association's letterhead was printed at the top of the sheet, and the letter was signed by the president of the association. By the letter the Rotarians were invited to hold their next convention in Atlantic City. The typewriter, which originally formed an exhibit at the Panama-Pacific Exposition, was described in the April, 1915, issue of the Popular Mechanics Magazine.

## REMODELED BATTLE CRUISER IS FLOATING AERODROME

The airplane ship "Furious" is one of the most remarkable vessels in the British navy. Originally designed as a fast battle cruiser, it was remodeled during the war for the less exciting but equally important task of mothering the airplanes and dirigibles which have come to play such essential parts in the maneuvers of the fleet. Forward and after decks were both covered by broad platforms to provide landing areas. Connecting runways allowed the planes to be rolled from one area to another.

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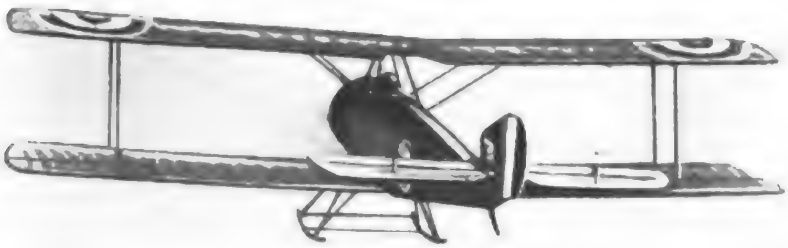

While Mother Ships like the "Furious" Are Valuable in Maneuvers of the Fleet, Lone Ships on Scout Duty must Carry Their Own Airplanes. The Problem of Launching Them from the Narrow Decks has been Met in Various Ways. Runways are Laid on Some Battleships along the Big Guns; on Others, Temporary Platforms are Erected on Forward or After Deck. The Plane in the Photograph has Just Risen from a Platform of This Kind

This Is the British Cruiser "Furious," Ship of Mystery, Rumored to have Crossed the Atlantic in Three Days. Some Foundation for the Story is Seen in the Structure of the Vessel, Built Long and Narrow Like an Overgrown Destroyer. After a Short Career as a Superdestroyer It was Converted into a Mother Ship for Seaplanes. Permanent Launching Platforms Carried on Steel Columns were Substituted for Forward and After Turrets with Their Heavy 15-Inch Guns



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The Hydroelectric Plant at Gatun, Canal Zone, in Process of Reconstruction to Increase Its Capacity: The Plant Operates at a Head of 75 to 80 Feet and will Use, at Full Capacity, 3,260 Cubic Feet of Water a Second. At the Right, One of the Spillway Gates is Seen Open

## CONDUCTS PROFITABLE SHOP IN NARROW QUARTERS

Not all profitable enterprises are large, as is proved by the razor-blade sharpening business conducted by a woman in a western city. In spite of the fact that her shop is but 23 in. wide, she declares her financial returns from the place to be satisfactory. A door forms the front of the shop, and to this is fastened the sharpening machine. In the upper portion of the door are windows, one of which opens for ventilating purposes and the transaction of business.

Although This Razor-Blade Sharpening Shop Is Only 23 Inches Wide, It Returns Satisfactory Profits to Its Woman Proprietor

## GATUN HYDROELECTRIC PLANT DOUBLES ITS OUTPUT

So great has been the demand for electric current along the Panama Canal that the output of the hydroelectric plant at Gatun, originally 6,000 kw., has been more than doubled, and provision made for still greater capacity. The three 2,000-kw. generators installed in 1913 are now running at overload. Driven by new wheels of increased power, they are giving 2,880 kw. The station building has been doubled in length, the addition accommodating three 4,500-kw. machines. One of these is already installed, giving a total present capacity of 13,140 kw. The penstocks for the three new units are of reinforced concrete, 12 ft. in diameter. At its ultimate capacity of 22,140 kw., the plant will use 3,260 cu. ft. of water a second, at 75 to 80-ft. head. An auxiliary oil-burning steam booster plant, at Miraflores, carries two-thirds of the capacity of the Gatun station. Part of the transmission line operates at 44,000 volts.

## PRINCE OF WALES TO START INTERNATIONAL AIR RACE

An unusual international air race has been scheduled for August 25. Contestants will start simultaneously from Toronto, Canada, and New York, the winner to receive a cash prize of $5,000. More than 40 entries are expected to be drawn by the attractive stake, and by the fact that the Prince of Wales will act as official starter.

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## SPRINKLER WAGONS WASH CITY STREETS WITH SHEEP DIP

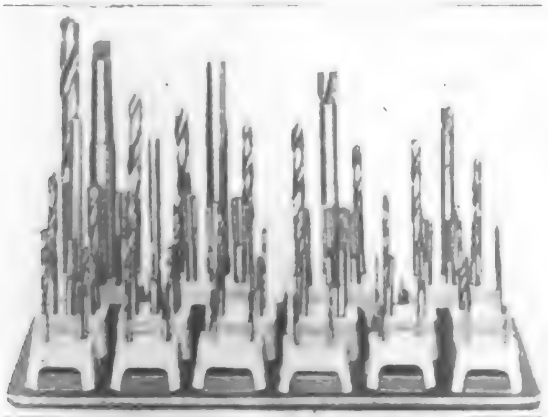
Taking "Odorous but Aseptic" as its motto, the health department of a large city recently ordered that every principal street be washed with a solution of sheep dip. One gallon of the liquid was mixed with every 70 gal. of water, and in this proportion was applied to the pavements by the city's sprinkling wagons. This measure was one of many adopted by the city council in its fight against the Spanish influenza.

## FLY PILOTLESS AEROPLANE OVER LONG COURSE

Indicative of the success being attained by experimenters with pilotless aeroplanes, a French machine of that type recently flew 112 miles in a course determined by those in charge of the wireless apparatus which controls the steering mechanism. At the conclusion of the flight, which was witnessed by the French director of aviation, a successful landing was made at a chosen aerodrome.

## TAP AND DRILL STANDS SIMPLIFY SHOP WORK

Of value to the toolmaker and stockkeeper is a new tap and drill stand, resembling a miniature metal table, in the top of which are holes for holding upright these tools. Smaller sizes hold a body drill, a tap drill, and two taps. In the larger sizes there are holes for a body drill, a counterbore, a tap drill, and taper, plug, and bottoming taps. Each hole is marked. A complete set includes 16 stands of various sizes on a wooden tray.



Taps and Drills are Held in Convenient Positions by These Stands. Each Tool Hole is Marked

## STRANGE PARACHUTE EQUIPPED WITH PROPELLER AND RUDDER

One of the strangest parachutes to be patented thus far resembles a Chinese umbrella, with a foot rest, a propeller,

In This Manner the Inventor would have the Airman Escape from a Burning Plane. The Propeller and Rudder Carry Him to a Desirable Landing Field

and a rudder fixed to the lower end of the "handle." It is the inventor's idea that this propelling and steering arrangement will enable the airman to guide himself to a desirable landing place. In practice he would have the airman remove the folded parachute from a rack beneath the upper wing, step out of the fuselage and upon the platform, finally releasing the parachute. During the descent the airman turns two cranks on the "handle," thus revolving the propeller and giving the parachute horizontal as well as vertical motion. The inventor does not claim to have descended in his invention.

¶Streams formed by melting snow have been used to sluice snowslides from the government railroad tracks between Anchorage and Seward, Alaska. Three slides recently blocked traffic on the road. Two of these buried the track under 50 ft. of snow, while the third was 25 ft. thick.

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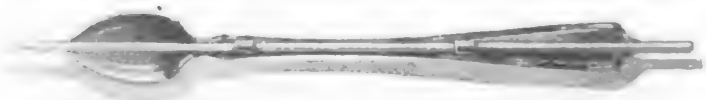
# SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



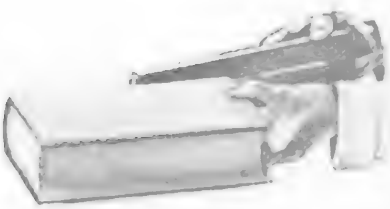
Ferrules on the Handle of a Late-Pattern Ice, Tea, or Lemonade Spoon Hold an Ordinary Paraffined-Paper Straw

Not Only does This Noiseless, Electrically Operated Machine Wash the Air, but Heats or Cools It According to the Season. It is Used for Ventilating, Drying, Deodorizing, or As a Simple Fan

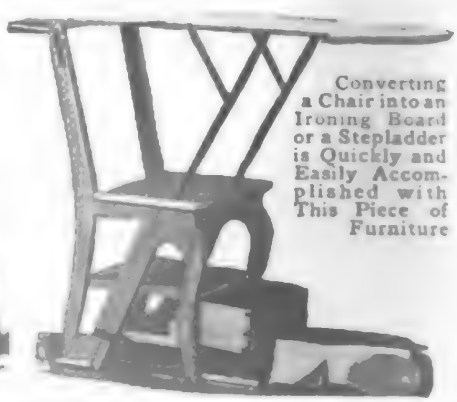
Brooms Made of the Leaves of the Date Palm, Common in Some Parts of the Country, have Given Satisfaction, and are Said to be Dustless. A Floor Broom and a Whisk Broom of This Material are Shown in the Picture

Two Chemicals are Held Separately by a New Fire Bucket Particularly Suitable for Use in a Private Garage. When Thrown on a Fire, the Liquids Unite to Form a Fire-Smothering Gas

Attached to the Oven Gas-Supply Pipe, This Device Controls the Flow of Gas to Keep an Even Heat in the Oven at Any Desired Temperature



Thieves Are Not Likely to Suspect a Book of Containing Jewels. This Case Looks Like a Printed Volume, but It can be Securely Locked



Converting a Chair into an Ironing Board or a Stepladder is Quickly and Easily Accomplished with This Piece of Furniture

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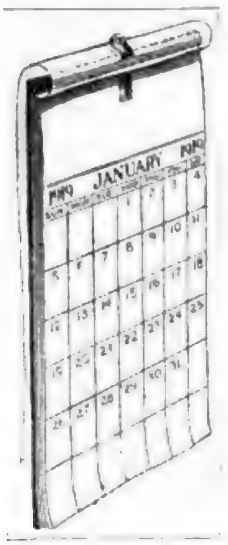
## IMPROVED WALL CALENDAR IS PERMANENT DIARY

An improvement in the familiar wall calendar used for advertising display has appeared. It is featured by a small rectangular opening in the upper portion of each page, which makes it possible to fold a page back over the eye or hook on the last day of each month, instead of tearing it off as is now the custom. Thus the page may be used as a conspicuous daily memorandum during the month, and on the last day may be turned back to become a permanent record or diary for reference during the year.



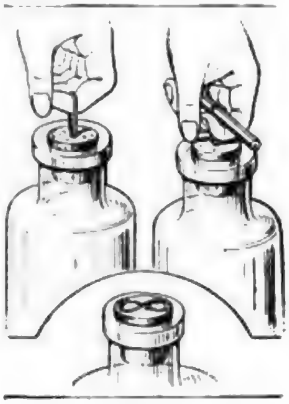

## ELECTRIC-LIGHT GLOBE BOILS WATER OUT OF DRILL HOLE

After a three-inch drill hole had been bored into a huge rock preparatory to a blast in a western mine, a rainstorm filled the hole to a depth of about two feet. The hole in the rock was about six feet deep, and as the blast had to be placed in the very bottom to insure best results, the problem of getting the water out was a difficult one. Building a special pump and taking the water out of the hole was considered, but could not be accomplished without considerable delay and expense, and siphoning was out of the question, because all of the surrounding country was higher than the rock.

Then the engineer in charge of the mine suggested boiling the water out with an electric-light globe. This scheme was tried and worked out successfully. An ordinary 32-cp. incandescent lamp was lowered into the drill hole until it floated on the surface of the water. Half an hour after the current had been turned on, the water began to leave the hole in the form of steam. The lamp was lowered as the water receded, and in eight hours the hole was emptied. The lamp was left burning in the hole, however, for two hours, until every trace of moisture had been eliminated. The blasting operation was then successfully undertaken.

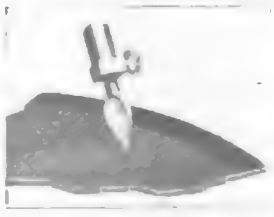
## LOOP OF CORD SAVES TEMPER IN PULLING CORKS

Only when a cork breaks, or falls into the bottle, does one think at all of this humble article of commerce. Yet one inventor feels that, other things being equal, consumers will favor the brand of goods which is most conveniently removed from the container. So the cork he advocates is featured by a firmly anchored loop of cord, which permits easy extraction and conserves the cork. As this device permits the use of a much smaller cork, the inventor also claims that its adoption will save money for the manufacturer.



## PHONOGRAPH NEEDLE PLAYS BOTH LOUD AND SOFT TONES

A phonograph needle is now produced which will play either loudly or softly without being removed from the socket. If soft music is desired, the needle is inserted with its broad face parallel with the front of the case. If it is later desired to increase the volume of sound, the needle is turned through 90° without interrupting the music.



¶ Post-office authorities have announced that registered mail will now be accepted for delivery in both Turkey in Europe and Turkey in Asia.

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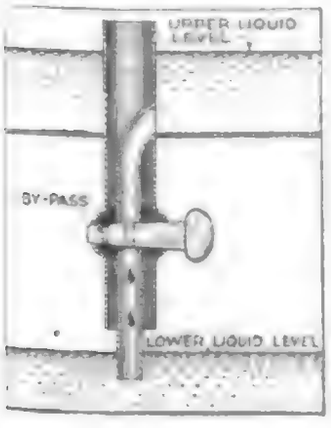
## HUGE PIPE OF WOOD STAVES OVER MILE IN LENGTH

An enormous water pipe, built up of wooden staves to a diameter of 13½ ft., has been laid at Niagara Falls, Ontario, to connect a hydroelectric plant gatehouse and surge-tank penstocks, 6,750 ft. apart. This great tube, constructed with exceeding care because of lack of precedent, rests on supports 4½ ft. apart. The staves are cut from Douglas fir, 6 in. wide and 4 in thick, with faces, inside and out, finished to the curve of the pipe radius, and the edges dressed to exact radial lines. Lengths vary from 12 to 32 ft., with 80 per cent of the total number, however, more than 14 ft. long. Iron tongues, 1½ in. wide and ⅛ in. thick, inserted in saw cuts, hold adjoining ends of staves in line. The tongues, slightly wider than the wood, also grip the sides of neighboring staves. The hoops binding the pipe together are of ⅞-in. mild steel, in two pieces, each with one end threaded to bolt into a shoe on the opposite end. At the penstock end of the pipe the hoops are spaced 2½ in. apart, increasing to 8¾ in. at the forebay end.

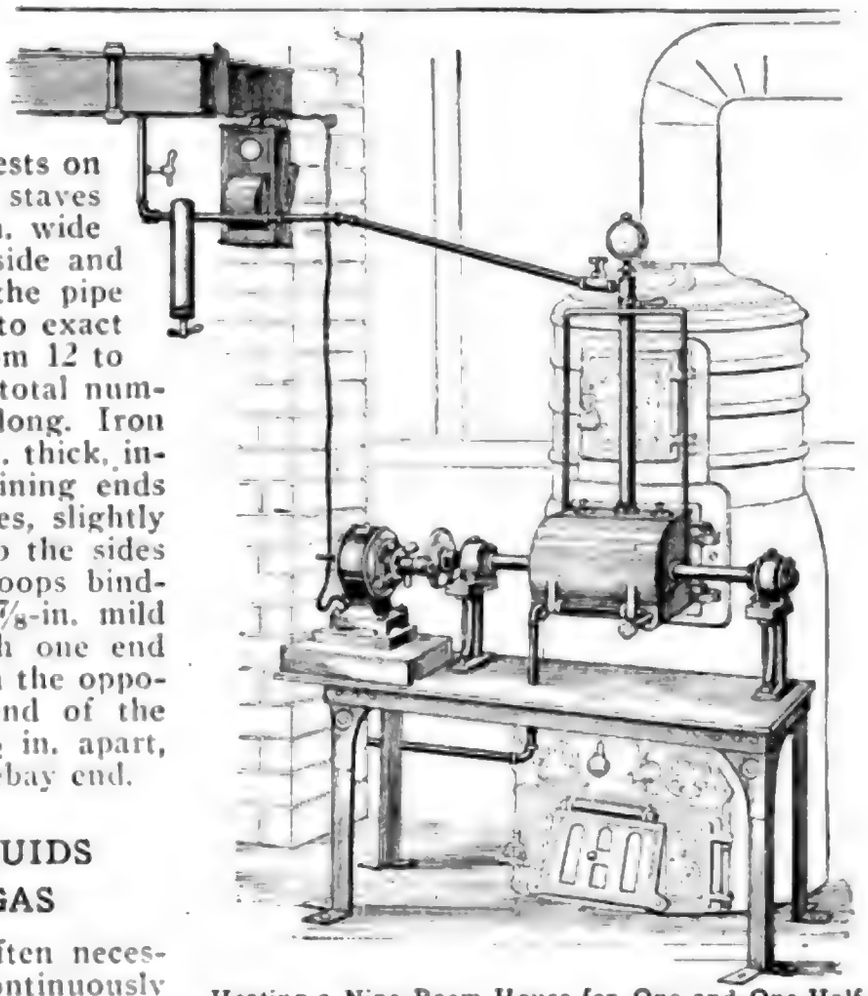
## STOPCOCK FOR LIQUIDS HAS BY-PASS FOR GAS

In the chemical arts it is often necessary that drops of liquid fall continuously from one vessel into another through a stopcock. In some cases, as for example in the generation of carbon dioxide, where the lower liquid is a carbonate solution and the upper an acid, pressure of gas may stop the flow. A stopcock devised in an eastern university has two concentric tubes. The outside tube terminates above the surface of the liquid in both vessels, and an annular groove in the key of the stopcock forms a by-pass, always open, for the gas pressure. The inside tube opens through the side of the outer tube below the surface of the upper liquid, and the lower end extends down into the lower liquid. The drops pass through this tube.




## SIMPLE OIL-BURNING PLANT REDUCES HEATING EXPENSE

Extreme economy and simplicity are features of an oil-burning furnace recently patented by a Canadian. A fan, driven by an electric motor, vaporizes crude oil by forcing two currents of heated air through a chamber in which the oil drips. The resulting gas, mixed with four parts of air, is ignited by a piece of burning oily waste or rag. A deflector breaks up and distributes the gas flame. It is claimed the furnace will heat a nine-room house for less than one and one-half cents an hour.



**Heating a Nine-Room House for One and One-Half Cents an Hour Is a Very Economical Proposition, and the Canadian Inventor of the Oil-Burning Furnace Pictured Here Says It can be Done with His System**

## SOUTH AMERICAN TREE SAP SUBSTITUTE FOR MILK

Sap obtained from a tree which grows on the banks of the Magdalena and Opon rivers, in the Department of Santander, Colombia, South America, is a palatable and nutritious substitute for cows' milk, declares a recent report. Known as "perillo" to the inhabitants of the region in which it is produced, the sap is pre-

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ferred by many to milk, especially for use in coffee. Condensed and made into cakes, perillo is very popular.

## LAMP EXTINGUISHES ITSELF WHEN OVERTHROWN

To eliminate the danger of explosion and fire, an inventor has designed a kerosene lamp, or lantern, which is automatically extinguished when tilted or overthrown. The principle is a simple one. On each side of the wick is a wing, or snuffer, which rotates on an axle parallel with the wick. At one end of each axle is attached a lever that holds a small weight. When the lamp is tilted, one of the weights moves through a small arc, throwing a snuffer over the wick and extinguishing the flame.

The Detailed Views at the Right Show How One Wing or Snuffer is Certain to Cover the Wick and Extinguish the Flame When the Lamp is Tilted

## RADIATOR-CAP ATTACHMENTS MAY NOW BE LOCKED ON

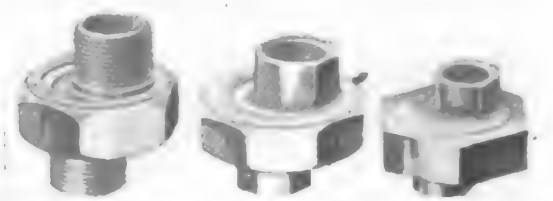
Now that auto owners are attaching valuable instruments to their radiator caps, means for protecting them from theft is desirable. A California concern is bringing out a small tumbler lock, easily fitted to any radiator cap by drilling a hole in the top. The lock engages one leg of an adjustable U-pin, the other leg of which is inserted in a hole through the side of the cap and filler nipple.

## TO USE GERMAN ARTILLERY TO TEST UPPER AIR

Engines of death and destruction will become instruments for the gathering of scientific data, if the idea of a member of the French Astronomical Society becomes a reality. The scientist proposes to use the large-caliber guns captured from the Germans for sounding the higher strata of the atmosphere by shooting into the air projectiles containing apparatus for recording conditions at great altitudes. Investigation of the proposal by a ballistic expert indicates that the best results would be obtained by shooting vertically, using a streamlined projectile. Fired from a 13½-in. gun, such a projectile would travel 77,080 ft. into the air in 69 seconds, and have a velocity of 1,755 ft. per second at the conclusion of its earthward fall. Another projectile of similar shape and weighing 484 lb., would travel 258,136 ft. into the air in 125 seconds if fired from a gun of the type nicknamed "Big Bertha," and while falling would attain a velocity of 1,666 ft. per second. The initial velocity of this projectile would be 5,248 ft. per second.

## DOUBLE-ECCENTRIC PIPE UNION SOLVES JOINING PROBLEM

To facilitate the joining of two pipes which are out of alinement, a double-eccentric union has been placed on the market. Threaded inlets are placed eccentrically on both sides of the union. These may be adjusted with a wrench to meet the pipe ends perfectly. A concrete insert may be adjusted to receive a pipe end at exactly the right point, even though the insert has not been placed accurately.



Joining Pipes That Are Out of Alinement is Made Easy with This Double-Eccentric Union

¶Two army officers have laid plans for the first aerial boxing match. They will meet in the tonneau of a big bombing plane, while referee and timekeepers sail alongside in another plane.

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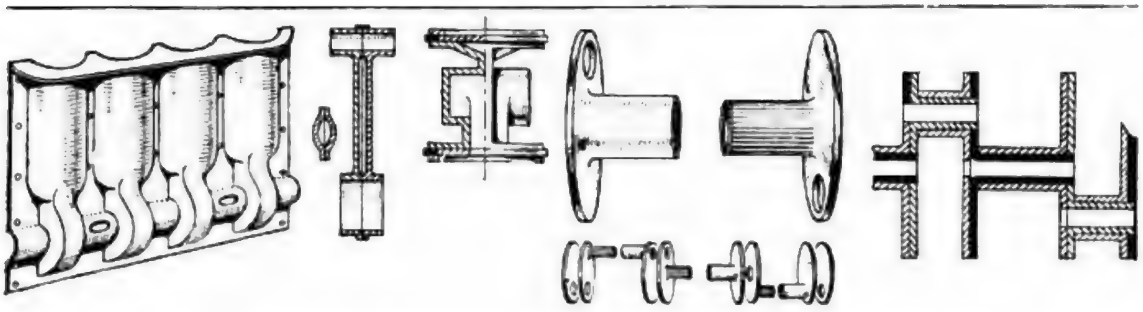


BY COURTESY OF THE MOTOR CYCLE

Sheet-Steel Stamping for One Half of Four-Cylinder Engine is Shown at Left. Next Coming Longitudinal and Cross Sections of Connecting Rod; View (Partly in Section) of Assembled Piston, and at the Right Five Views, Perspective and Section, of the Method of Building Up the Crankshaft

## GASOLINE ENGINES STAMPED OUT OF SHEET STEEL

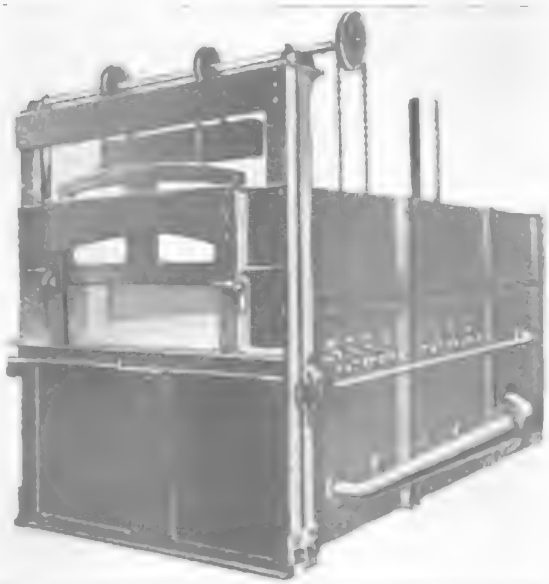
A decided innovation in gasoline-engine construction is revealed by an English inventor, who already has the commercial development of the idea under way. The entire engine is built up of sheet-steel stampings. In a four-cylinder model, two identical stampings form the crank case and cylinder block, the stampings being bolted together. Steel-tube linings, a head stamping with valves in place, and pressed-on water jackets, complete the cylinders. The crankshaft is made of disks with pressed-out portions for hubs and crank pins, the latter telescoping and reinforcing each other from opposite disks. Six stampings are required for the piston, exclusive of rings, and two are needed for each connecting rod. The method is declared to reduce cost and weight, and increase strength and manufacturing facility, especially for quantity production.

## MEASURE, STRAINER, FUNNEL COMBINED IN OILCAN

A flexible nozzle, positioned like the spout of a teapot, is the feature of a new graduated container for lubricating oil. A hook at the upper edge holds the nozzle upright, and above the opposite handle is a thumb lever actuating a regulating valve in the bottom. The oil passes through a strainer before issuing from the nozzle, and when the latter is depressed the measure becomes a funnel. A cover is fitted if desired.

## ECONOMICAL GAS FURNACE STORES EXHAUST HEAT

Economy of operation is the feature of a new gas annealing-oven furnace emphasized by the British firm which manufac-



Practically No Heat is Wasted by This Gas Annealing-Oven Furnace, According to the Makers. The Secret Lies in the Two Heat-Storing Chambers underneath the Oven

tures it. It is built with the idea of conserving all the heat resulting from combustion. Two heat-storing chambers are located under the oven proper, and air entering the furnace is directed through these alternately. While air is passing through one storage chamber, the other is being heated by gases escaping from the oven. Gas is fed into a space above the chamber through which air is passing. Figures cited to indicate the efficiency of the furnace show that with a temperature of 2,242° F. in the oven, the temperature of the flue gases was only 181 degrees.

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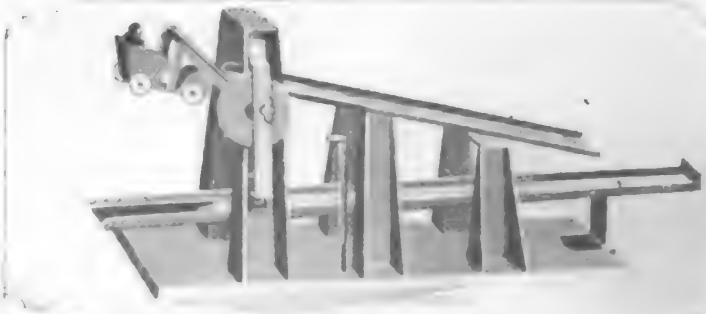
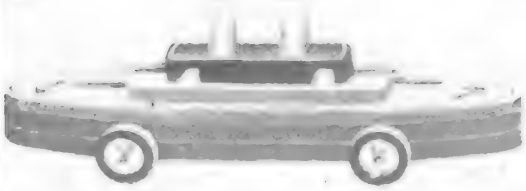
The Rubber Band Sends This "Monoplane" Dart High above the Treetops. At the Top of Its Flight the Wings Spread Open, and the Little Plane Glides Lazily to Earth. The Picture Shows How It is Shot into the Air, and How It Looks from Above in Its Descending Glide



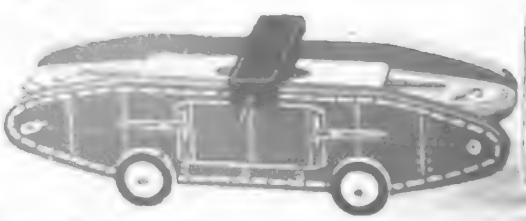
This is Said to Be One of the First Mechanical Toys to Replace the German Products Which Once Crowded the Market. The Little Auto is Kept in Constant Motion down the Inclines by the Revolving Arms

While the Old-Fashioned Hobbyhorse Rocks Tamely in the Nursery, This Impetuous Steed Speeds along the Sidewalk in Real Steeplechase Fashion. The Rider Steers It by Turning the Head, Just as with a Regular Horse. It won't Break under Big Brother's Weight Either, as It is Tested in the Factory under 500 Pounds' Pressure

This Phonograph Record is Clamped to the Holder. So, When the Weighted Arm is Swung, the Needle Travels around the Groove and the Paper Sings the Tune



The Very Small Youngster is Delighted with His Own Cleverness Each Time He Transforms His Wooden Battleship into a Fighting Tank. Every Piece must be Used to Make Either of the Toys



The Two Lower "Decks" of the Dreadnaught at the Left Become the Sides of the Tank; the Cabin is Turned Crosswise to Become the Turret, and the Funnels Hold the Sides Together



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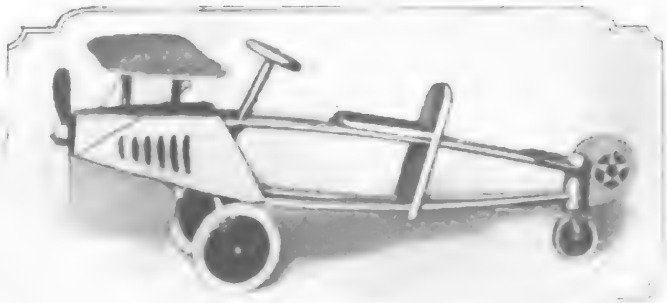
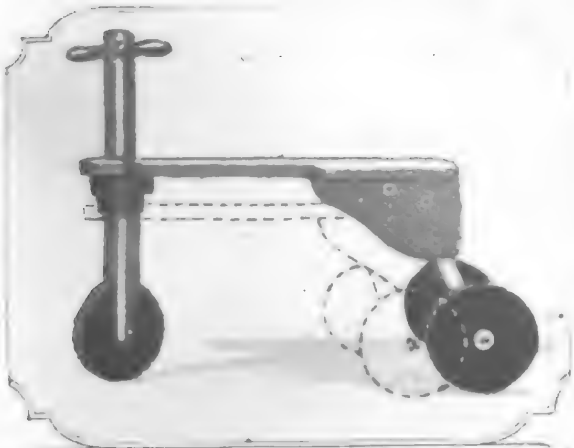
Here Is a Simple Wooden Toy Which Quickly Rocks Its Way into Baby's Heart. It Isof Sturdy Construction, with the Seat So Close to the Floor That a Fall Is Not a Serious Matter

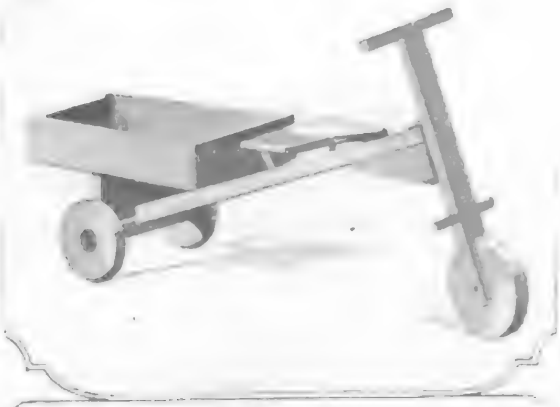


This Juvenile Airplane Is So Light That a Small Child can Carry It. Yet It Boasts a Wing Spread of 24 Inches and will Support a 200-Pound Person without Breaking. Two Chubby Legs Furnish the Motive Power

Pressure on the Stirrups Sets This Wooden Pony to Swinging. It is Shown on Its Outdoor Mounting, but It may be Hung from a Doorframe if Desired. For Youngsters of Four Years or Less, the Swing is Made in a Safer, Inclosed Form



As Baby's Legs Grow Longer This Little Car is Adjusted to His New Requirements. The Tail-piece Slips into Any One of Three Positions, While the Front is Adjusted by Placing the Collars of the Steering Column above or below the Seat



For the Very Small Man of Business This "Truck" will Fill a Long-Felt Want, as the Body Easily Holds Eight Mud Pies or an Equivalent Load. Like the Others on These Pages the Toy is Designed to Withstand the Knocks of the Hardest Play



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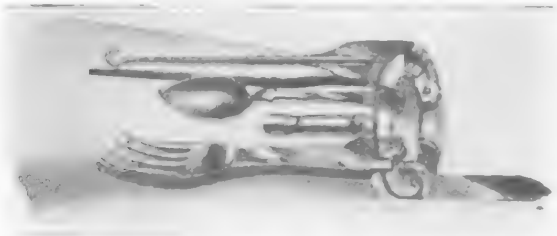
## ARTIFICIAL ARM HAS CUTLERY AND OTHER TOOLS ATTACHED

A whole outfit of useful implements, including knife, fork, and spoon, button-



Artificial Arm Carrying All the Implements the User Really Needs, Which Open and Close Like Jackknife Blades

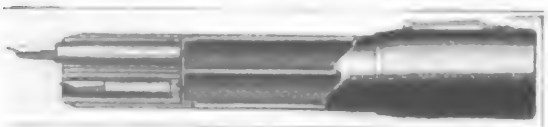
hook, and whatever else the user may desire, is directly attached to an artificial arm patented by an English inventor. The arm ends in a wrist plate, on which the various tools are pivoted. Normally they rest in grooves in the arm, held by a wire spring at the pivots. When extended for use, the same spring prevents unexpected closing.

## SECTIONAL DESK FILE EASY TO ADJUST

A desk file recently placed on the market consists of adjustable units, each one of these being two plates of sheet steel, facing each other and so fastened together that their relative position may be changed by a simple operation. The size of the file depends upon the number of units and their adjustment. Rubber feet prevent the file from scratching a desk top, while an index adds to the convenience of the device.

## DOUBLE-POINT FOUNTAIN PEN WRITES IN TWO COLORS

Draftsmen, bookkeepers, and others who make use of different-colored inks in their work, will be interested in certain improvements recently made in fountain-pen construction, whereby two pen points having a single holder can be used. Independent reservoirs for the inks are provided in twin cylinders within the barrel. The pen point likely to be more used can be permanently extended, while the other may be withdrawn into a recess, so that it will not interfere with the free use of its companion pen.



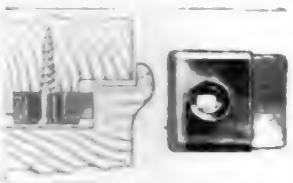
"Double-Barreled" Fountain Pen That Writes in Two Colors of Ink: One of Its Points Slides Back Out of the Way of the Other

## AUTO DEVICE STOPS ENGINE WHEN OIL RUNS TOO LOW

The danger of running an auto engine dry, and damaging it, is overcome by a new device, which screws onto the crank case in place of the lower pet cock. It consists of a float in a small cylinder, with a visible indicating rod projecting from the top, and an electrical contact in the bottom. When the oil is dangerously low, the float grounds the ignition circuit by bringing the contact points together, and the engine comes to an immediate stop.

## AUTO DOORS MADE SILENT BY SIMPLE ABSORBER

Improvements are being made now in the very smallest details of the automobile. One of the latest is a device to eliminate noise and jar caused by the slamming of the door of a car. Invented by a northern Illinois man, it consists of a square of rubber and a metal washer of special shape. The rubber is fastened to the edge of the door next to the frame by means of a screw through the washer, and acts as a shock absorber.



¶ The first ship to sail for Europe directly from Chicago with a cargo of meat left the lake port recently for Liverpool, England. Another vessel, similarly laden, cleared for Hamburg, Germany, a short time after the departure of the first.

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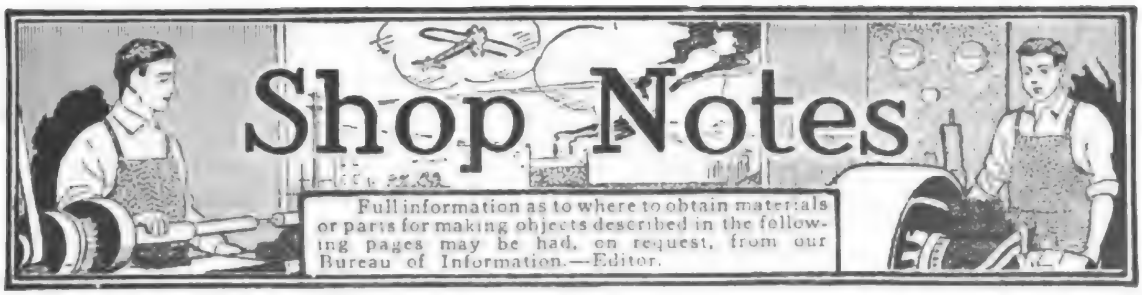


# Modern Indoor Lighting at Small Expense

By WILTON G. RICHARDSON

MODERN ideas of indoor lighting require that no open flame or electric filament must be directly visible to the eye. This is the result of a practical appreciation of the fact that a moderate amount of light, properly distributed, enables the human eye to see much better than a much greater quantity of light not properly placed, especially if, in the latter case, a strong light glares into the eye. There is, in fact, a movement to make illegal the use of lights in factories and offices which present to view surfaces that glow too brilliantly, say, those which radiate illumination at a greater rate than 3 cp. per square inch. This would mean that nothing brighter than the open fishtail gas flame should go unshaded, for the ordinary gas mantle has a much greater brilliancy, and the filament of any type of electric light is still brighter. Even this brilliancy of 3 cp. per square inch is to be taken as a maximum, and not as a desirable specification for good lighting.

The ideal method of illumination, with a view to avoid fatigue of the eyes, is conclusively found to be that of "indirect lighting." This means that the source of light must be entirely shut off from the vision, and that all illumination must, therefore, be by light reflected from white or light-colored surfaces. All "bright spots" are thus eliminated from the field of vision, and the eye is relieved from all glare. Particularly in the case of children's eyesight, it is found that providing good illumination, either by the indirect system or by the use of shades between the light and the eye, much relieves the strain, and permits longer periods of reading or studying without eye fatigue.

Since scientific lighting fixtures are rather expensive, it is interesting to see how some of their benefits can be obtained by those who are not in a position to invest large amounts of money in lighting fixtures. The first photograph shows how the combination fixture in the living room of a flat was converted into an indirect-lighting fixture; the picture was taken by the light of the lamps photographed. The arms supporting the electric sockets, which were formerly bent downward at a 45° angle, were bent up to the position shown. As the tubes were of brass, this was easily done with the hands, leaving no tool marks. The frosted-glass shades were replaced with metal reflectors. These had a dark finish on the outside and a polished surface on the inside. Indirect lighting, such as furnished by lamps thus fitted, need not be made strong enough for reading fine

**By Bending the Arms Supporting the Electric Sockets of an Ordinary Lighting Fixture, and Substituting Metal Shades, It is Adapted for Indirect Lighting**

print, or other exacting work, since to produce indirect lighting of such brilliancy involves the use of a large amount of



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current. A rather dim light will be found quite comfortable for ordinary use, and when a stronger light is necessary for some particular purpose, it may be supplied by a table lamp, furnished with a shade which will prevent the filament from ever being directly seen by the eye.

Another interesting specimen of this kind of work is furnished by a California woman who converted her summer parasol into a beautiful floor-lamp shade, as

A Pongee Parasol, Decorated with Some Beads and a Fringe, was Converted into a Shade for a Floor Lamp

illustrated in the above photographs. The cover of the parasol was of a natural pongee design in old rose and blue, with dots and a border stripe of black. Removing the cover from the parasol, she took the frame to a wire worker and had him run a wire around the lower edge, soldering it fast to the ribs. He also put a collar in the top of the frame. Inside it, he crossed two wires, to support a ring in the center which fits down over the little post at the top of the pedestal, upon which the shade rests.

Strips of old-rose silk, 1 in. wide, were used in binding the wires of the frame, the rough edges being turned under. Part of an old evening gown was used for the old-rose lining of the shade; this was tightly stretched over the frame, and was made secure by pinning it to the wrapped wires. The lining of the shade which covered the outside of the frame was stitched to the upper side of the wrapped wire, care being taken to leave no wrinkles in the silk. The pongee parasol cover was then stretched over the old-rose lining, and tacked down in a similar manner.

Before finally stretching the parasol cover into place, a few dozen nail-head beads in different colors and sizes were purchased, and sewed upon the black spots and upon the border of the parasol cover. After the cover had been fastened to the frame, the raw edges were turned back on the outside and stitched in place. A band of silk fringe, in old rose and black, was then sewed to the lower edge of the shade. A beaded galloon, costing 20 cents per yard, was used to outline the ribs of the frame, and also used to conceal the raw edges at the top and bottom of the shade.

The total cost of this ornamental floor lamp was $18.20, made up of items of $2 for the wire frame, $1.60 for the galloon, 60 cents for the beads, $4 for the fringe, and $10 for the base, or pedestal, with full electrical equipment, including a three-light cluster and three tungsten lamps. It would be difficult to purchase a lamp of similar design at retail for twice that amount.

### Artificial Ivory from Eggshells

The student of clay modeling can add interest to his work by varying the materials used, and extremely decorative effects may be obtained with imitation ivory. Make a paste by mixing alcohol with equal parts of finely powdered eggshells and isinglass, warming the vessel which contains the mixture by placing it in a jar of hot water. The paste is very easy to work while it is moist, but hardens when it becomes dry, and looks exactly like ivory. If it sets before the design is completed, it can be softened again by adding warm alcohol.—S. Leonard Bastin, Bournemouth, Eng.

### Punching Holes in Auto Lamps

The small oil side lamps still used on many automobiles are apt to be extinguished by road shocks. As the front wheels drop to the road level after passing over a small obstruction, part of the air inside the lamp is forced out at the top, and there is not enough left to nourish the flame. This condition can be corrected by filling the partial vacuum created by the escaping air. Punch two small holes with a nail, just under the door of the lamp, and sufficient air will enter from below to take the place of that which escapes at the top.—Edwin Schubach, Chicago, Ill.

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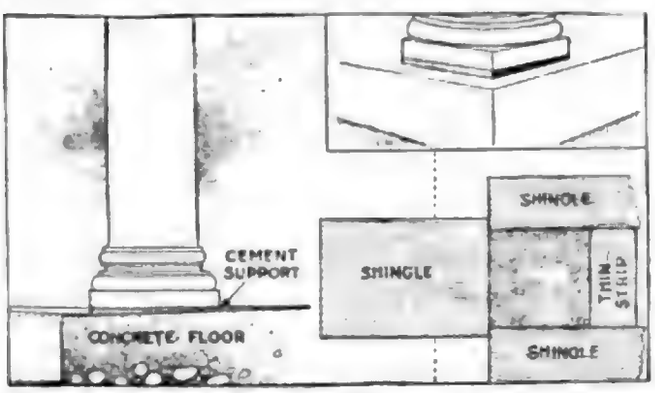
## Cement Supports for Porch Columns

Some years ago I built a concrete porch floor in the front of my house, and decided to use columns turned from wood to support the roof. I wished to prevent water from getting under the columns and rotting them, but wished also to find some method which did not produce such an unsightly appearance as do the cast iron sub-bases which are ordinarily sold for the purpose.

Accordingly, I placed the square wooden bases on the porch floor in exactly the positions they were to occupy later. Since the slant of the floor was practically the same as the taper of a shingle, I placed a shingle on either side of every base with the thick ends in line with the front side. Then I selected some wide shingles and fastened one with its thick end touching, for a very short distance, the thick ends of the other two shingles. Next, I fitted a thin strip of wood between these two shingles, at the back side of the base, the thickness of this strip being determined by the thickness of the shingles at this point. When these forms were completed and held in place by weights or other convenient means, the wood bases were carefully lifted out. I then made a rich mixture of cement and sand, and after wetting the floor inside the forms, filled each with cement and leveled the top with the top of the shingles and the thin strip. As soon as the cement had dried slightly, I removed the forms and left it to harden.

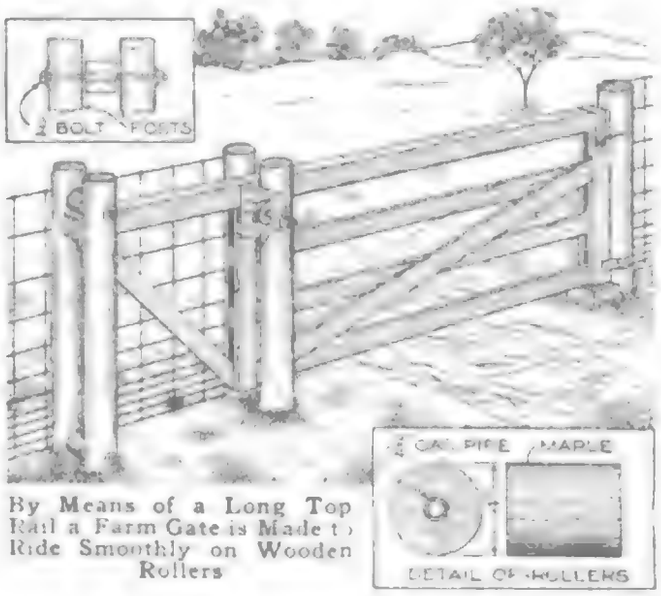



**Thin Cement Sub-Bases for Wooden Porch Columns Permit the Water to Flow Out, and Thus Prevent Rotting of the Columns**

The next day the columns were erected. They have stood for a long time. The wood shows no signs of decay, though the floor is in a place entirely exposed to the weather. These concrete bases were sufficiently high to prevent water running under the wood; they were cheap, inconspicuous, and durable.—Arthur J. Dunckel, Dolgeville, N. Y.

## Farm Gate Moves on Rollers

A sliding farm gate which rides on rollers is easily opened and closed, and such gates would be commoner if it were not for certain difficulties of construction. The gate must be suspended, as the earth is too soft to support the rollers, and




By Means of a Long Top Rail a Farm Gate is Made to Ride Smoothly on Wooden Rollers

if it hangs from a track, barn-door fashion, the passage through the gateway will be obstructed. This difficulty can be overcome by furnishing the gate with a long top rail which projects several feet beyond the rest of the structure, as shown in the sketch. The projecting part bears against a roller placed above it, so that equilibrium is maintained by the principle of the cantilever. There is less strain upon the posts than in the case of a hinged gate, but it is necessary to plant them firmly, as the gate will not ride easily if they are bent from the vertical. Each pair of posts should be bolted together before being set in position, and should be set 3 ft. deep, with a coat of creosote on the lower part, to prevent rotting, and with wooden blocks spiked around them, to keep them steady. The rollers are made of hard wood, bored to hold a bushing of ¾-in. gas pipe, which should be made a tight fit. They are then placed between centers, or on a mandrel, and turned true, after which they should be boiled in linseed oil to make them weatherproof.—H. A. Shearer, Willits, California.

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**Valuable manuscripts, or other writing, may be preserved and protected by applying collodion with a fine, silky brush. When this is dry, even soaking in water will not blur the writing.**

# Three Simple Bridges for the Farm

Although thousands of farms are crossed by small streams, good farm bridges are rarely seen. The type most used consists of two or three logs, thrown

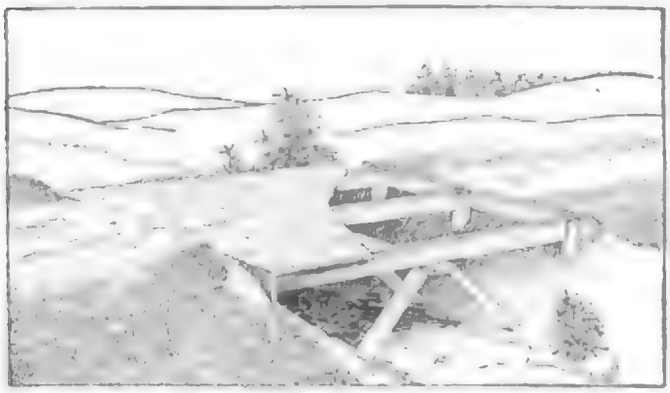

Fig. 1
For Short Spans, a Bridge of Great Simplicity can be Relied on to Support Even a Heavy Tractor

across the stream and covered with planks, which are usually loose. Such bridges cannot be trusted to carry heavy loads, such as tractors and threshing outfits, and require repairing after high water.

The bridge shown in Fig. 1 is very simple, but is very strong when used in short spans of not more than 16 ft. The ends of three 3 by 12-in. planks are set edgewise in short posts or piles, driven into the ground, 5 ft. apart, on the banks of the stream or gully. A 12-ft. length of 3 by 12-in. plank is supported under the centers of these stringers, by posts driven into the banks of the stream so as to form a trestle. Upon this simple but strong framework are nailed 3-in. planks, 12 ft. long. If likely to be swept by high water, the long timbers should be securely spiked to the posts upon which they rest.

Another simple bridge is shown in Fig. 2. The three stringers are 3 by 12-in.

Fig. 2
A Bridge for Short Spans Where It Is Not Convenient to Have Supports in the Middle

planks set edgewise, on piles driven, 5 ft. apart, in the banks of the stream. These stringers are floored with 12-ft. planks. Other 3 by 12-in. planks are then set up edgewise over the two outside stringers, and ¾-in. bolts are put through both stringers and floor. They should be spaced 3 ft. apart, and should have large washers at each end.

The bridge shown in Fig. 3 is more complicated, because it is intended for longer spans. Four piles are set in each bank, spaced 3 ft. apart on centers. The stringers are 3 by 12-in. planks, spliced as shown in the sketch, the splices of the adjacent stringers being placed alternately on either side of the center of the bridge. A 3 by 12-in. plank, 12 ft. long, is bolted to the underside of the stringers, in the center of the bridge, before the 3 by 12-in. by 12-ft. floor planks are spiked on. Two other stringers are bolted on top of the flooring, over the two outer stringers, as in the second bridge described. Then two 8-ft. lengths of plank are spiked upright at the center of the bridge, one on each side. These should

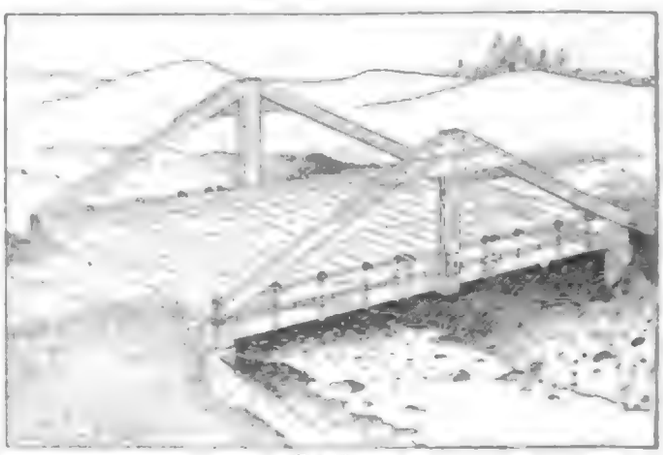

Fig. 3
For Somewhat Longer Spans, a Bridge Reinforced with a Simple Truss will be More Practical

be spiked to both stringers, and spiked very firmly, or bolted, to the timber under the stringers; in fact, it is well to mortise the ends of the horizontal timber into these upright tension members. Other planks are strung from the ends of the bridge to the top of the uprights. Here they are fastened by triangular pieces of plank bolted to the sidepieces, and to the uprights.

These bridges are all made from common sizes of planks, which can be obtained even at small lumber yards. Each bridge is simple to plan and cut, and all three are sufficiently strong for all ordinary needs. The 12-ft. width is enough to permit passage over the bridge of practically every farm implement.—J. Horace Van Nice, Waukon, Ia.

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### Patching and Prolonging Life of Auto Tops

After being used for two seasons, the rubber-composition top of an automobile is likely to develop holes where creases occur. To close each opening, and prevent water from dripping through, cut a circular patch of canvas, coat one side with tire cement, and also coat the inside of the top around the hole. Let the cement dry for a few minutes, and then coat both the top and the patch again liberally. Leave them for 10 or 15 minutes, after which place the patch in position, and hold a heated flatiron over it, thereby curing the cement and making it hold. The cracking and peeling of the rubber is caused by exposure to rain and sunshine. After the first year, the composition looks dry and rusty, and the threads which hold it together begin to break; but the top will last three times as long if it is rubbed with body wax four or five times a year. Do not use liquid polish, but paste, as this has more body and affords more protection, being remarkably effective in shedding water, so that the fabric under the rubber does not decay.

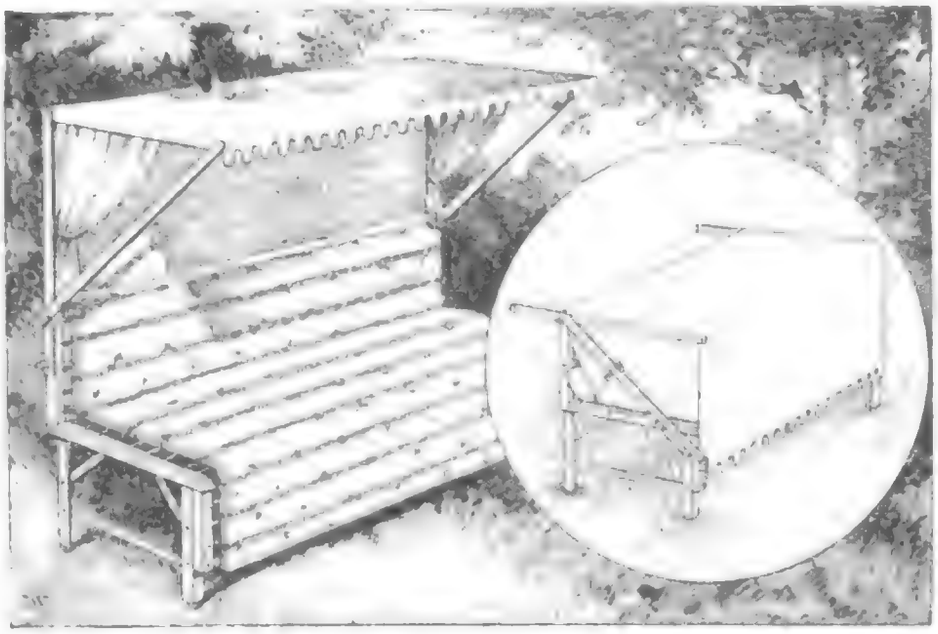
When the windows in the side and rear curtains begin to look yellow with age, a cloth dipped in vinegar will clean the celluloid, thereby improving the appearance of the windows and affording clearer vision to the driver of the car.—George A. Luers, Washington, D. C.

### Oats for Stretching Shoes

Tight shoes mean sore feet, especially in the army. A method of stretching shoes, which probably originated on the farm, was used to good purpose at the front. Its advantage lies in the fact that no tool is necessary. Soak a quantity of oats in hot water for a few minutes, fill the tight shoe with the wet grain, and let it stand overnight. In the morning the grain will have swelled sufficiently to expand the leather and make the shoe comfortable.—Harry R. Schultz, Ames, Ia.

### Combination Outdoor Couch Bed and Shaded Lawn Seat

An old spring couch rendered good service to its owner long after it had become too shabby to be kept in a parlor. He placed it out of doors, and used it throughout the summer as a garden seat in the daytime, and as a bed at night. He made a cover of canvas supported by strips of thin iron, and attached it to the back of the couch by means of bolts which acted as hinges, so that it could be raised and lowered. In this way the couch was completely curtained at night, and protected by an awning from the sun in the daytime. In the latter case, the cover was raised and kept rigid by means of pins, which passed through the upright members of the couch frame and also through two of the strips on which the canvas was spread. These two strips were then in a vertical position, and formed extensions of the uprights of the couch; but at night, when the couch was entirely curtained, they were lowered to a horizontal position, so that the portion of the canvas which they supported formed a canopy, or roof, with curtains on all sides to hide the couch completely from observation. During the day the curtains at the two ends were unnecessary, and were therefore folded back and fastened with tape to the upright portions of the cover frame.



A Spring Couch Does Duty in the Daytime as a Garden Seat, and at Night as a Protected Outdoor Bed

¶ Plugged-up sink or drain pipes may be cleaned by pouring gasoline into the opening.

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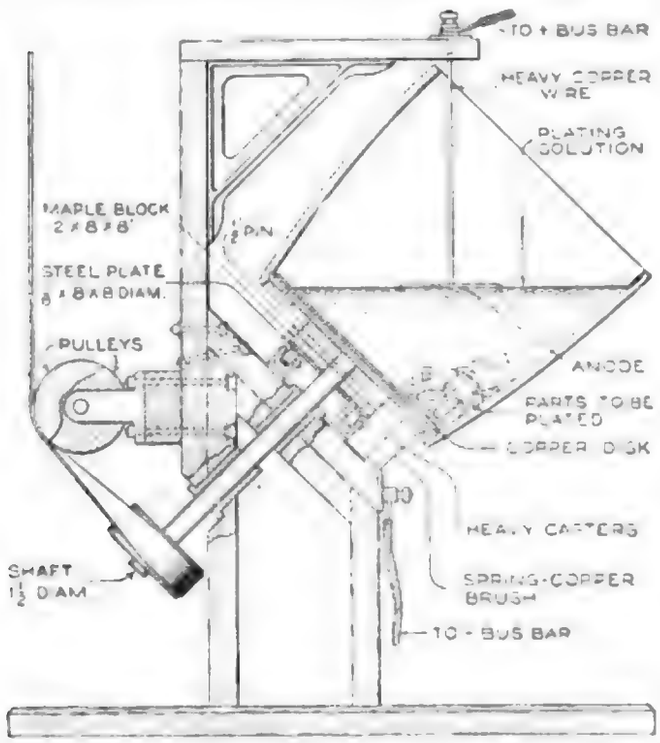
# A Rotating Electroplating Tank for Small Parts

By KENNETH M. COGGESHALL

NOT only is it difficult to electroplate small bolts, nuts, screws, washers, springs, and the like, in a still tank, but the finish is apt to be rough. Where large quantities of small parts are to be plated, stringing them on wires preparatory to the process is a long and tedious job. A simpler method of doing the plating is to utilize a rotating tank, so devised that the parts constantly roll over one another, and yet are in electrical contact with the negative power circuit. This rolling action of the small parts insures an even plate, with the added advantage of buffing




**The Rotating Tank, Working Somewhat Like a Tumbling Barrel, Provides a Method of Depositing Metal Evenly on a Large Number of Small Parts**

and polishing. Hundreds of pieces can be plated at one time in this manner. Such a rotating electroplating tank is by no means difficult to construct, and no special tools or equipment are required for constructing it.

For the tank, secure a heavy watertight barrel. Cut it in half along its large circumference. On the half reserved for use, make certain that all the hoop bands are secured firmly in place. From a sheet of copper, about $\frac{1}{16}$ in. thick, cut a disk whose diameter is less than that of the barrel head. This disk is then secured with screws to the inside of the barrel bottom. In like manner, a brass or copper ring, 2 in. wide and $\frac{1}{8}$ in. thick, is cut with an outside diameter slightly less than the copper disk. This ring is fastened to the outside of the barrel bottom and is connected electrically by a heavy copper wire to the inside disk. When the tank is in operation a brush rubs against this collector ring, and thus the pieces being plated, lying, as they are, in contact with the copper disk, are connected electrically through the disk, collector ring, and brush to the negative power circuit, or bus bar. The brush is made from several copper strips, 2 in. wide, and is secured to the supporting framework in such a position that it will bear against the collector ring.

The driving shaft is made from an iron bar, $1\frac{1}{2}$ in. in diameter and $21\frac{1}{2}$ in. long. A block of hard wood, such as maple, is screwed to the bottom of the tank inside the collector ring. At the true center of the barrel head is drilled a $1\frac{1}{2}$-in. hole, through the block but not through the head. The shaft end is driven into this hole, and a hole is drilled through the side of the block and into the shaft; a short piece of rod, driven through the block, will hold the shaft from turning in the block. A steel plate of suitable size is secured, and a $1\frac{1}{2}$-in. hole is drilled in its center. Four screw holes should also be drilled and countersunk, at points equally spaced from each other near the circumference. This plate is attached to the wooden block by four flat-head iron screws. Care must be used in putting this plate in position, since it will serve as the backing plate for the simple roller bearings.

The framework, or standard, for supporting the barrel should be as rigid as possible; a general design is suggested in the sketch. Arrangements are made so the axis of the barrel lies at an angle of 45° with the horizontal. Four heavy furniture casters are fastened to the framework in such manner that they will roll against the steel plate as the barrel revolves, thus forming a simple roller bearing to take up the weight of the plating tank. Two bearings of antifriction metal should also be provided, to take up the lateral thrust due to belt drive, as well as to center the plate over the casters.

A crown-face pulley is placed on the free end of the shaft, and two similar pulleys are placed in the position shown. The driving belt will be held on the shaft pulley through the aid of the other two pulleys. A light scaffold is constructed to support the anode, as indicated in the

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sketch. This anode, which may be a heavy plate of copper, nickel, or zinc, depending upon the type of plating to be done, is suspended from a heavy copper wire which is fastened to the scaffold and connected electrically to the positive side of the power circuit. The anode is immersed in the electrolyte, and during plating the current passes from it through the solution to the small parts on which the plate is deposited. When the plating operation is completed, the parts are pulled over the edge of the barrel into some retainer, with the aid of a small instrument, like a toy hoe.

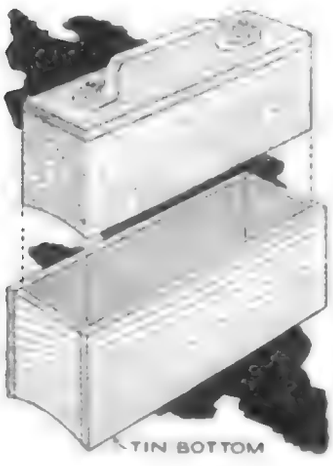
The same precautions should be observed in plating by this method as in the still-tank process. Current regulation and solutions will be the same as usual. The only noticeable difference due to the rotating-tank method will be that quicker and better results will be obtained.

### Nail Used as File Cleaner

A handy file cleaner can be made by flattening the point of a large nail on an anvil, or other hard surface, and filing the end square. A few strokes across the file will cut a row of teeth which will dig down into the grooves and remove all dirt. Such a tool is far more effective than a brush in a woodworking plant, where files tend to gather a good deal of pitch.—Frank A. Rice, Ouray, Colo.

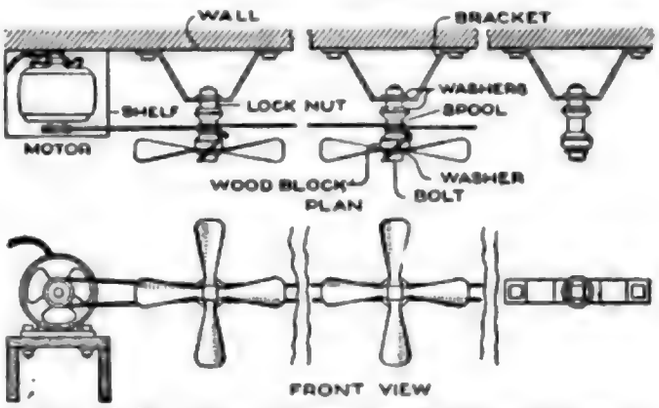
### Sand Block Polishes Commutators

A piece of sandpaper fastened flat on a wooden block is not as effective in smoothing the surface of a commutator as a curved block made for the purpose out of cement and sand. Make a box from ¾-in. boards, giving the required curve to the lower edge of the end pieces, and nail a sheet of tin to the bottom, after bending it to the same curvature. This box serves as the mold, or form, to give the required shape to the block. To make the mixture, use six parts of clean, sharp sand to one part of Portland cement, and add a tablespoonful of sugar to every pound of cement. Mix thoroughly with water until the paste is loose enough to take the shape of the mold readily, and then put on the lid and leave the material to dry. When it is solid, remove the sides and bottom of the box, and drill two holes through the lid into the cement to take expansion bolts, which will be used in securing the handle. The result will be a sand block that will last indefinitely. —James E. Noble, Kingston, Ont., Can.




### Motor Drives a Row of Fans

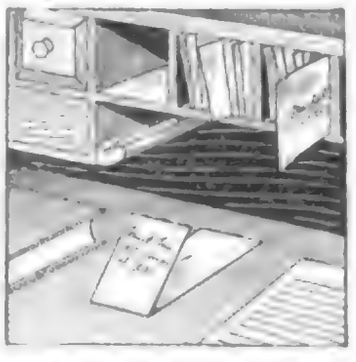
To avoid the expense of installing motor-equipped fans, the keeper of a public hall attached a row of large spools to a wall by means of brackets, and fastened fan blades to each spool. All the fans were connected with a small motor by a long string, which passed around each spool in turn, operating like a machine belt. A high rate of speed was not attained, but there was sufficient to cool the hall, and the air was circulated freely enough to insure complete ventilation.—W. Wallace Snyder, Bedford, N. Y.




**A Set of Homemade Fans is Distributed along a Wall, and Belted to a Motor by a Long String**

### Engagement Reminder for Desk

Without constant reference to memoranda, engagements are likely to be forgotten. A doubled sheet of paper with one leaf at an angle, as shown, will not be overlooked.



¶ Nuts that have dropped into awkward places in automobiles may be removed by greasing the end of a stick and fishing for them with this implement.

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## Ladder Hooks and Boxes for Painters and Fruit Pickers

When working on a ladder, it is desirable to have both hands free, and so an adjustable bracket which will hold a load

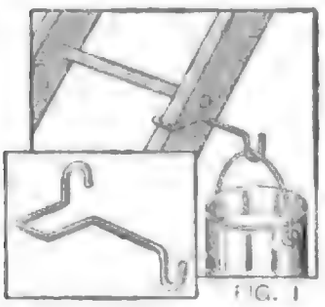


FIG. 1

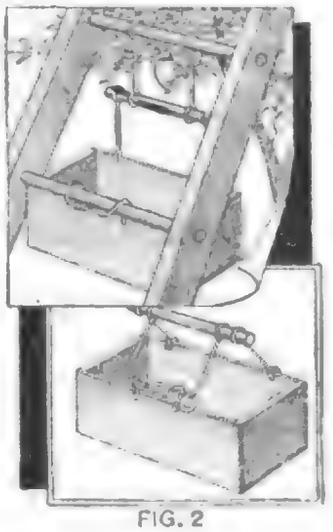
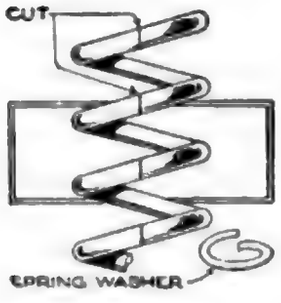


FIG. 2

**Wire Supports Used for Hanging Paint Pots, Baskets, and Other Articles, on Ladders, can be Contrived in Such a Way That They do Not Interfere with a Workman's Hands**

at any elevation on the ladder is very convenient. Coarse wire is the best material to use, and the pattern of the contrivance is determined by the nature of the work to be done. Fig. 1 shows a very simple pattern, which is serviceable for both fruit picking and painting. It is much handier than the double hook so often used to hang a paint pot in the center of a ladder rung, as it keeps the pot clear of the ladder and out of the workman's way. The construction shown in Fig. 2 is not so simple, but far more adaptable. It is best suited to fruit picking, and the wires are so arranged that they do not interfere with the picker's hand as he loads his basket or box. When it is full, he detaches it from the ladder, and by a slight readjustment of the wires he is provided with a handle to carry it away.

## Using Broken Valve Springs




Do not throw away the broken spring of an automobile valve. Cut it into sections, so that each complete turn forms a unit; file the ends smooth, and use the pieces for spring washers.

A water barrel cut in two makes two good washtubs. Two opposite staves furnish the handles of each tub by being allowed to project above the others.

## Conserving Batteries of Stationary Gas Engines

A mechanic who used a four-cycle stationary engine regulated its speed by means of a governor, which operated by holding the exhaust valve open and preventing the engine from sucking in a charge. When this took place the spark was wasted, and as he wished to avoid draining energy from his battery unnecessarily, he contrived a contact adjustment by which the circuit was kept open except when the exhaust valve was closed. He mounted an insulated strip of brass on the rod which operated the exhaust valve, and connected it with the battery. He mounted another strip on the cylinder, and adjusted it so that it made contact with the strip on the rod when the exhaust valve was closed. The strips were connected to the ignition circuit, which thus remained open even when contact was made at the timer, and was closed only when a charge of gas was ready for firing.—Arthur A. Richardson, Centre Barnstead, N. H.

## Homemade Steel-Stamp Mounting

The metal stamps which are frequently used to mark numbers on tools and machine parts are apt to be mislaid, and this is a strong argument against using a set of separate stamps for the different numbers. Experience has shown that it is a much better plan to make an instrument with all the stamps attached, so that it can be handled like one of the adjustable rubber stamps with which dates are printed. The illustration shows the dimensions to be followed in making a handy tool for this purpose, but no allowance is given for loose or tight fits, as clearances are easily provided with a reamer or file. Any kind of steel can be used, but, of course, tool steel is best.

Make the handle first, of square stock, turning it to a cylindrical shape where indicated, and knurl it, so that it can be firmly gripped in the hand. Cut a slot in the square end, and at the bottom of the slot drill a hole extending nearly to the other end of the handle. At the top of the hole, slot the metal again, in such a way that the second slot forms a continuation of the first, but is narrower; then drill a hole through the square end, piercing the jaws on both sides of the wide slot, so as to hold a pin, for a bearing. Cut a steel disk to revolve on the pin, and drill a hole through the center

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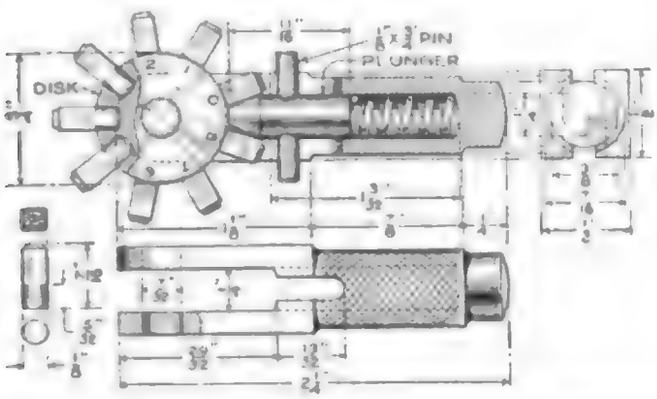
to hold it. Ream after drilling, so that the pin will be a loose fit in this hole when assembled, and a drive fit in the holes already made in the jaws of the handle. Divide the circumference of the disk into nine equal parts, make prick-punch locations for the holes which are to hold the different stamps, and use the stamps to mark numbers on the side of the disk against the nine locations, so that they may be easily identified. Ten will not be necessary, as 6 and 9 will be marked by the same stamp.

Then determine the size of the holes in the circumference of the disk. From the stamps cut off the portions that are to be used, and bevel the ends which will enter the holes. Also bevel the end of one of the discarded portions, and, to avoid experimenting with the stamps, use it to determine the size of the holes needed to make a force fit. The experiment should be made by drilling holes of different sizes in a piece of scrap steel, and a few trials will show what diameter will give a drive fit without violent hammering. Having determined the size of the drill, make the holes at the locations prick-punched on the circumference of the disk, and drive in the stamps, using a piece of wood or brass to protect the figures on the faces.




**A Piece of Bar Stock and a Revolving Disk Form an Instrument for Stamping Any Number Desired on Tools and Machine Parts**

A plunger must be furnished to keep the disk from turning after the stamp has been set, and this will be dropped into the hole drilled through the length of the handle. Bevel the end which is to fit between the stamps projecting radially from the disk, and be careful to make the fit a fairly snug one, so that the disk will not oscillate when the tool is in use. A coil spring is placed below the plunger at the bottom of the hole, to hold it rigidly against the disk, and, when the latter is to be shifted, the plunger is pressed back by means of a short pin which passes through it.

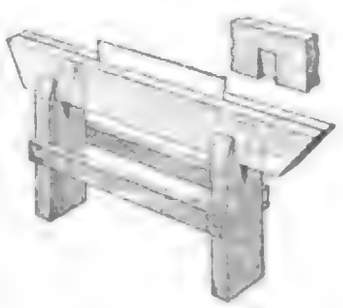
A glance at the drawing will show the order in which the parts are to be assembled and, if reasonable care has been exercised in filing and reaming the parts where the adjustments call for accuracy, there will be no appreciable lost motion while the tool is in service.—C. Ray Haynes, Centre Village, N. Y.

## A Vegetable Sprinkler

For keeping vegetables fresh, some small stores use a device consisting of a vertical pipe connected with the water main, and surrounded by two or three circular dishes of galvanized iron, all of which except the lowest one have several holes punched in them. The dishes are covered by conical pieces of coarse wire netting, upon which the vegetables are laid. The water escapes from a jet at the top, strikes a cap or baffle plate placed over it, and is thereby broken into a fine spray. This falls upon the vegetables below, and eventually passes into the bottom dish, where it escapes through a waste pipe. The dishes are secured to the pipe by iron clamps.

## Saw Clamp Made from Sticks

A carpenter went to work on a job without his saw clamp, and in the course of his work he had occasion to use it. To avoid a trip, he made one out of some scraps of lumber. Two boards were planed smooth to serve as jaws, and after the saw had been placed between them, they were dropped into V-shaped cuts which had been made in two 2 by 4-in. pieces, set upright. Tapered grooves were cut in the jaws where they entered the V-shaped cuts, so that they were gripped tightly together by being forced downward. The angle of the V-cuts should not be more than 20° or 25°. —Willis E. Berg, Flagstaff, Ariz.



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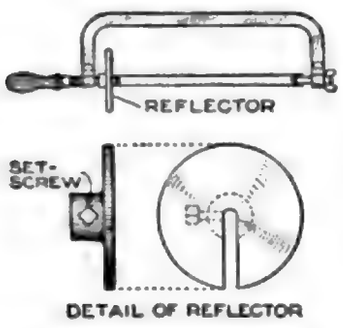
### Mirror on Hacksaw Blade

A small nickelplated disk, placed on the blade of a hacksaw in the manner shown, will act as a reflector and throw light on the material along the edge of the blade. In this way it will greatly assist the operator if he is working in a dark place and has no helper to hold a light. Even with an assistant, it is often more of a hindrance than a help to have a portable lamp held near the operator's eyes; but a reflector of this kind takes up practically no space, and throws all the light on the work without dazzling the workman.

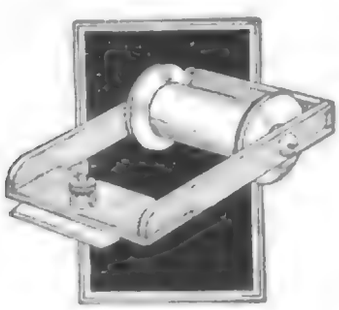



### Painting the Stairs

A staircase coated with fresh paint is out of commission unless a narrow track is left unpainted at one side or in the center, to be covered later when the rest of the paint is dry. But when a surface has been coated piecemeal in this fashion, it has an uneven look, and a better method is to paint alternate steps, using the unpainted ones for ascending the staircase, and coating them later when the painted ones are dry. As each step is painted, coat the riser belonging to the next step, so that fresh paint will not be injured if a riser is accidentally kicked in using the stairway.—J. H. Moore, Toronto, Can.

### Razor-Honing Frame

A very serviceable frame for holding double-edged safety-razor blades while honing them, can be made in a short time out of pieces of a cigar box, an empty spool, and some glue, plus a screw and thumb nut from an old dry battery. The spool is placed in the frame so as to revolve freely, its position being determined by the angle desired between the blade and the hone. The blade is placed below the crosspiece at the front, and the screw is passed through both from below, whereupon the thumb nut is put on and tightened. Then, to sharpen the blade, roll the holder back and forth over the hone. When one edge is sharp, loosen the nut and turn the other edge to the front. In this way both edges are sharpened on one side, and to sharpen them on the other side the blade is turned over. It is, of course, necessary to pivot the spool in such a position that the angle between the blade and the surface of the hone will allow sufficient clearance for the head of the screw; if there is not quite enough room, the head can be filed down.—Albert E. Jones, East Milton, Mass.

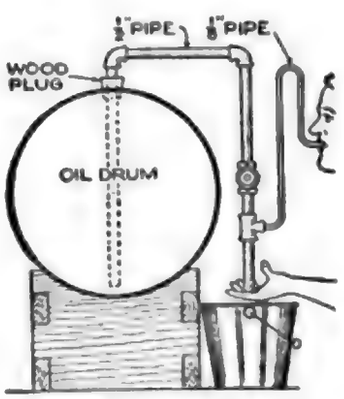


### Green Food for Poultry Kept in Wire Sling

Green poultry feed gets dirty if thrown on the floor of the poultry house, and is only partly consumed. The hens will eat it all if it is kept in a pouch, or pocket, hung by a cord from the roof of the house, or fastened to the wall like a manger. The best material to use is 2-in. mesh poultry wire, which will hold any waste vegetables and weeds, and will enable the birds to get at the feed from beneath without letting them spill any of it. Hang it in such a position that the hens will be able to reach it without straining or jumping.—J. T. Bartlett, Ft. Collins, Colorado.

### Starting a Tank Siphon

It is not uncommon to apply the principle of the siphon in drawing gasoline from a tank into a pail, but an objection to starting the flow by sucking the end of an ordinary hose is the disagreeable experience of getting the taste of the gasoline. To avoid this, set the tank on blocks, so that the bottom is above the top of the pail, and use a metal tube for the siphon. Make a tee joint in the tube, a short distance above the lower end, and attach a smaller pipe to the joint. Placing the finger over the lower outlet, the air is sucked from the siphon until the flow has been started, and a valve shuts off the stream when pails are being exchanged.—J. C. Smith, Kodiak, Alaska.

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### Retracing Badly Creased Blueprints

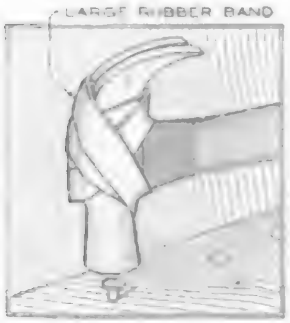
It is difficult to trace a blueprint that is prevented by folds or wrinkles from lying flat. To straighten such a print, soak it in water, hang it up by one corner, and allow it to dry. Do not hang it against a wall, but from a line, so that air will have access to it on all sides. Use no mechanical means of drying it.

### Thimble for Acetylene Work

An acetylene welder suffered constantly from burns on one finger of his left hand, where the sparks fell most copiously from his torch, and his glove gave little protection, as the material on this finger was generally burned through. A thimble was rolled out of scrap sheet copper, with the metal turned over at one end to form the top, where a small hole was left for ventilation, and a guard projected down the back to protect the knuckle. The seam was soldered at the side, so that the falling sparks might not drop directly on the seam, and melt the solder.—E. B. Van Vliet, Paterson, N. J.

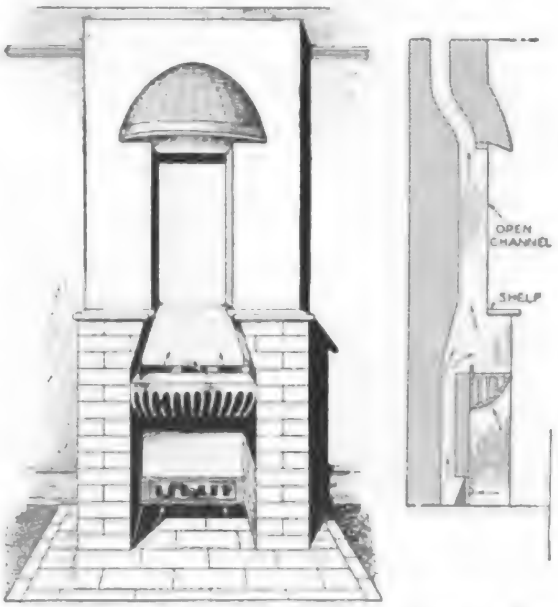
### Rubber on Hammer Protects Woodwork

A soft bumper, or fender, on the head of a hammer will insure the safety of adjacent wainscoting, when nails are being driven into a floor close to the wall. Wind a large rubber band around the hammer head, giving it several turns about the metal, so that it will act as a cushion, protecting finished surfaces from being scratched or dented by misdirected blows. The material is not heavy enough to affect the balance of the hammer.—Chas. H. Willey, Concord, N. H.




### Unusual Type of Fireplace

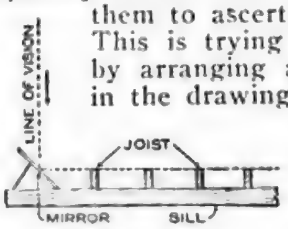
It is not usual to build an open-fire grate 30 in. above the floor for the purpose of warming a living room in a farmhouse. This method of construction has, however, been found very successful on a farm in one of the southern states, distributing the heat thoroughly without permitting the smoke to cause any trouble. An open channel carries the smoke up to a cowl which covers the entrance to the flue, about 4 ft. above the fireplace. It is kept traveling upward by means of a continuous draft which rises out of an air passage, running from a grating at the floor level up to the back of the grate, where it ends in the open channel. The constantly moving air causes the coal to be thoroughly consumed, and the height of the fireplace enables the heat to radiate in all directions. The latter feature gives this type of grate an advantage over the usual kind, which often expends too much heat on the hearth itself, without allowing much to reach the floor level in the middle of the room.—W. B. Gray, Louisville, Ky.




An Air Duct at the Back of a High Fireplace Acts as a Blower, and Also Keeps the Smoke Moving through an Open Flue

### A Mirror to Sight Levels

When laying sills or joists it is frequently found desirable to sight along them to ascertain the exact level. This is trying on the knees, but by arranging a mirror as shown in the drawing, an accurate sight may be taken while standing up. The mirror must be plane, or the image will be distorted and an accurate sight cannot be taken. A small plate-glass toilet mirror with easel back, procurable for a few cents, is excellent for this purpose, and will save much inconvenience.—Roy B. Snow, Ontario, Can.

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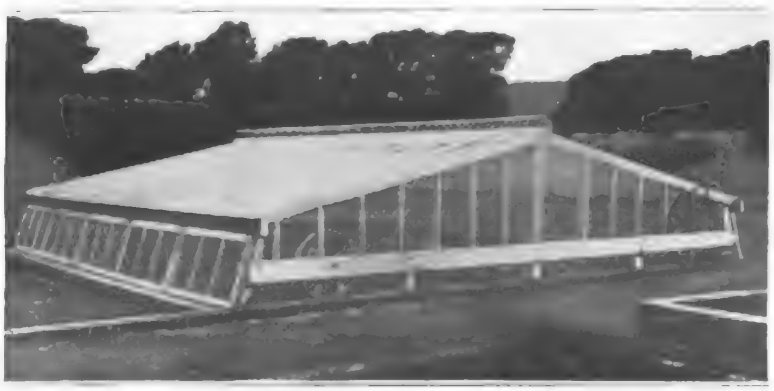
### Greenhouse Moved About on Wheels Has Wider Usefulness

A traveling glasshouse is a great convenience to the nurseryman or market gardener. Many crops require shelter only at certain periods of the year, such as in the early stages of their growth, or when they are coming to maturity. But if the plants are in the ground under a fixed structure, the shelter cannot be used for anything else until the crop is cleared, whereas a glasshouse on wheels can be taken from plot to plot, whenever needed. The side panes are hingd at the eaves, so that they can be lifted up whenever it is necessary to move the house over tall crops. It will be observed that the wheels run on ways made of bricks, but even without a track of any kind there is no difficulty in handling the structure. One greenhouse of this kind will serve a very large garden, as it is usual to plant crops which mature at different periods.



**A Movable Greenhouse Enables a Truck Gardener to Economize in Glass, and to Give Shelter to Different Crops in Turn, at the Period in Which They Need It**

### Salt Shaker Is Converted into Toothpick Holder

Some restaurant patrons regard the open toothpick holder with misgivings. Different classes of people use it, and when toothpicks stand in the same container for a long time, their chance of remaining clean is considerably reduced. A salt shaker with a metal screw top of the usual pattern can be used as a closed toothpick container. Cut a disk of rubber or cork, about ¼ in. thick, and of sufficient diameter to make a tight fit in the neck of the bottle. Force it into position with the metal top over it, and screw the latter down tight. Bore two ⅛-in. holes through both cap and stopper; then remove both, and countersink the holes on the lower side of the stopper. Fill the shaker with toothpicks, and replace both stopper and cap, taking care that the holes in both correspond. The container is now complete. When it is turned upside down, the countersink at each hole will guide a toothpick into the mouth of the hole, so that only two of them can escape at once, and the rest will be kept clean until they are to be used. Also, if the container is knocked over, none of them will be soiled; but, if the picks in an open container are spilled on the floor, it is not likely that any witness of the accident would want to use any of them.

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### Restoring Indistinct Graduations on Fever Thermometers

The ink in the graduations on a clinical thermometer is gradually worn away if the instrument is in constant use. It can be renewed by dipping a piece of cloth in ink and rubbing it along the graduations, care being taken to wipe off all surplus ink with paper before it has time to dry. Paper is used because it is too stiff to sink into the depressions at each graduation, and consequently the ink in these remains undisturbed. Ordinary writing ink gives fairly good results, but the waterproof ink used by draftsmen is blacker, and therefore better.—Harold E. Benson, Boulder, Colo.

### Roost Windows in Poultry Houses Aid City Breeders

The city poultry breeder generally finds a problem in the limited space of his poultry house, but he can add to the area by using roost windows. They should be long and narrow, and placed in the wall below the dropping boards, preferably close to the sill. One or two windows will usually be enough. As the hens scratch, they often pile up litter below the dropping boards, so that the space under them is wasted; but it is saved if roost windows are used, as hens always scratch with their heads toward the light, and they consequently pile up the litter behind them.

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### Fitting Flues When Cut Too Short

On a job of refluing a boiler, the flues were cut too short. A few of the new flues were inserted at random in their corresponding holes in the two flue sheets. They were fastened at one end. An iron rod, almost the size of the inside diameter of the flues, was heated white-hot, and inserted in one of the tubes. By repeating the treatment the flue expanded and increased in length. The flue thus lengthened was quickly rolled. This plan was followed on several other flues. Upon cooling, the flues shrank, drawing the flue sheets together, and decreasing the distance between the flue sheets from ⅛ to ¾ in. Then the job was ready for inserting the remainder of the flues, proceeding according to the usual practice.

### Motorcycle Garage in a Box

Motorcyclists will be interested in the garaging idea illustrated by the accompanying photographs. This simple box was built at a cost of about $8 by a motorcycle enthusiast who is over 75 years old. It was made from crate-end boards, obtained for the asking at the agency where the machine was purchased, and the principal items of its cost were the tar paper with which it was covered and the hardware entering into its construction.

By this method the motorcycle is housed in a minimum of storage space. Even in the most congested communities there are few motorcyclists who would find their living quarters so cramped for space that a motorcycle garage of this type could not be built. It furthermore gets the owner away from the not uncommon difficulty involved in keeping his machine in a shed or garage often several city blocks away from his residence.

The box is of such stanch construction that it could not be readily broken open. The two doors, end and top, make it very accessible when putting the machine away or removing it. The shelves along the sides are used for oils, greases, spare parts, and tools. All of these may be easily reached, and at the same time are equally well housed when the box is closed.

A track is laid along the floor of the box, into which the wheels of the machine fit. These enable the owner to run the machine either in or out of the box with only the end door open, the track serving as a guide to the front wheel and handlebars, so that it keeps to the center automatically. The top of the box is latched from the inside and the end door is secured with a padlock.

There are, of course, many features of construction which can be varied according to the needs or the convenience of the maker. Instead of crate boards, piano boxes may provide material for the purpose, and very little change is necessary. Two boxes are used, the back of each being removed, and they are then fastened back to back, with those portions facing outward which are ordinarily used to cover the front or keyboard side of the instrument. A door is placed at the end, and the arrangement of the interior fittings may be identical with those already described.

PHOTO BY COURTESY OF J. E. JONES

This Simple Motorcycle Garage Houses the Machine in a Minimum of Space, and Saves the Owner Many Journeys to and from a Public Garage. It Is Weatherproof, and Provides Sufficient Protection from Theft. Tools and Lubricating Oils are Kept on the Shelves along the Sides

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### Old Tanks Protect Water Plug

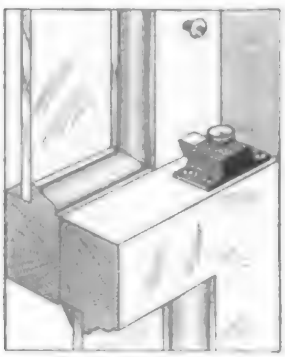
A water plug standing at a sharp corner is sometimes in danger of being damaged by rapidly driven vehicles. The photograph shows a provision made to

Two Old Tanks, Set One on Either Side of a Water Plug at a Sharp Bend in a Road, Prevent the Plug from being Struck by Carelessly Driven Trucks

safeguard the plug. Galvanized-iron tanks from a kitchen range were filled with sand to make them stand firm, and were then placed on each side of the plug, so as to meet the impact of any truck or wagon which came too close.—Monroe Woolley, San Francisco, Calif.

### Safety Catch for a Window

To make a very simple safety catch for preventing the raising of a window from the outside, a cabinet-door catch is screwed across one end of the top of the lower sash, so that it will just clear the edge of the upper sash. A screw is inserted in the corresponding upright of the upper sash, at a distance which will allow the sash to be raised to a height not sufficient to admit a man's body. When the sash is raised to this height, it comes in contact with the screw. To raise the window to its full height, it is only necessary to pull back the catch so that it will slide over the screw. The upper sash cannot be pulled down from outside without automatically closing the lower one.



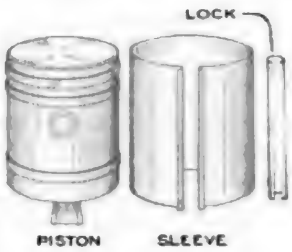
¶Motorists parking at the curb in city streets can find out the position of cars behind them by looking at the reflections in store windows, and so avoid collisions.

### Plumb Bob Hung from Tapeline

A mechanic who constantly used a long plumb line in his work, and found that he was often obliged to disentangle the line, attached the plumb bob instead to the end of a tape measure, which he rolled up in its case when not in use. The tape, although stiffer than the ordinary line, gave sufficient accuracy for the work.—A. M. Fairfield, St. Mary's, Kansas.

### Tin Sleeve for Replacing Piston Rings

There is little difficulty in fitting a piston carrying several rings into the cylinder, if a tin sleeve is used to compress the rings in their grooves as the piston enters the cylinder. When the rings have been placed in position, the sleeve is folded around the piston and locked with a strip of tin, after which the piston is forced into the cylinder entrance, the sleeve, of course, remaining outside. In this way each ring is kept from spreading until it has begun to enter the cylinder.




A less elaborate method, which is almost as effective, is to form the sleeve from a tin can, without bending the edges as shown, and then compress sleeve and rings by wrapping a piece of stiff wire around it and twisting the ends together with pliers. This method has the advantage of not requiring a different sleeve for every different size of piston, but the disadvantage of being a trifle more cumbersome.

### Salvaging Rusted Tools

A rusted tool is permanently impaired, for although it can be salvaged, it is more liable to rust again than one which has been kept in condition. To remove rust from a steel object, fasten it tightly with wire to a piece of zinc, and place them in a container holding water, to which a little sulphuric acid has been added. It is a good plan to use a large container, so as to treat several objects at once, and they should remain there until the rust has entirely disappeared, which may take some days, or even a week. When

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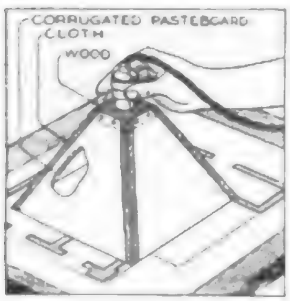
articles are badly rusted, add more sulphuric acid occasionally. The steel being in contact with the zinc, short-circuited battery cells are formed, and the rust is reduced to iron again by electro-chemical action. The steel becomes darkened, or blackened, by the process, but resumes its original color when rubbed with sweet oil or a mixture of petrolatum and kerosene.

### To Avoid Breaking Gauge Glasses

In cleaning a steam-engine water-gauge glass, it is important to avoid touching it with metal. Experience has shown that contact with a metallic surface may weaken the material so that, although it does not break immediately, it is likely to be found broken after a short time. For this reason it is advisable not to use wire in pushing a piece of waste through the gauge, but to use a thin piece of wood; also, in cutting new glass to the desired length, to insert the cutter from the end that will not be used. The reverse method was tried as an experiment with several lengths of tubing, and, although no breakage was observable at the time, all the lengths were found broken a short time later.

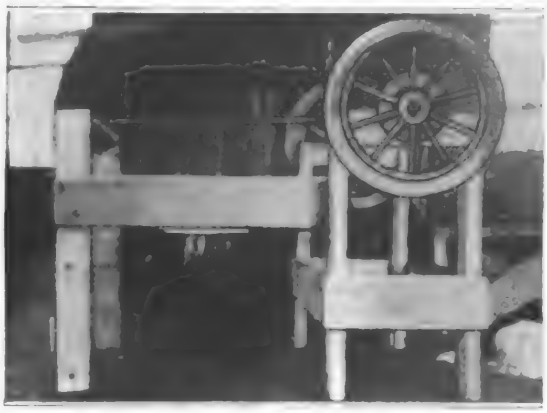
### To Dry Drawing Ink Quickly

A lamp shade with a carbon lamp in it will quickly dry India ink if set over a drawing, but an even better arrangement is to make a shade out of corrugated pasteboard, such as large cartons are sometimes made of. The air contained between the corrugations and the two sides acts as an insulation which retains the heat of the lamp. The shade should be about a foot square at the bottom, and is easily glued together, as shown in the sketch. It can be hung on a hook under the table when not in use. Care should be used not to set it over triangles or other celluloid instruments, as they will warp if heated. The device will save a great deal of time in any drafting room, especially in cold, damp weather when the ink is naturally slow to dry.—R. L. Ogden, Denver, Colo.




### Portable Bench to Hold Auto Rear Axles

The portable bench here shown was made for use in a repair garage, and was found very useful in overhauling rear



**A Movable Frame is Used in a Repair Shop to Support a Rear-Axle Assembly, While Doing Work upon It**

axles. The axle housing was disconnected from the frame of the car without disassembling the wheels or the drive shaft, the latter being uncoupled at the forward universal joint. The axle was then laid upon two of the three upper horizontal members of the wooden frame, while the third supported the drive shaft. The housing was prevented from shifting by semicircular grooves cut in the two supporting members. The lower horizontal pieces were ⅞-in. boards, 6 in. wide, and all the other pieces 2 by 4 in., the different members being fastened together with lag screws. The bench stood 30 in. high when completed, and was mounted on casters, so that it could be wheeled to any part of the shop desired, while a tool box, which hung across the frame, removed the necessity of frequent trips to lockers and stock cupboards. The tool box was formed by nailing a board between the two longest of the horizontal members, so that it formed the bottom of a cradle, or trough. Two other boards formed the sides, but only the bottom one is visible in the photograph.—L. B. Robbins, Harwich, Mass.

### Holding Bolt with Screwdriver

It is not always easy to reach the head of a bolt with a wrench so as to keep it from turning when a nut is being screwed on, although a screwdriver can be used. Slot the end of the bolt with a hacksaw, and hold it with the screwdriver while using the wrench on the nut.

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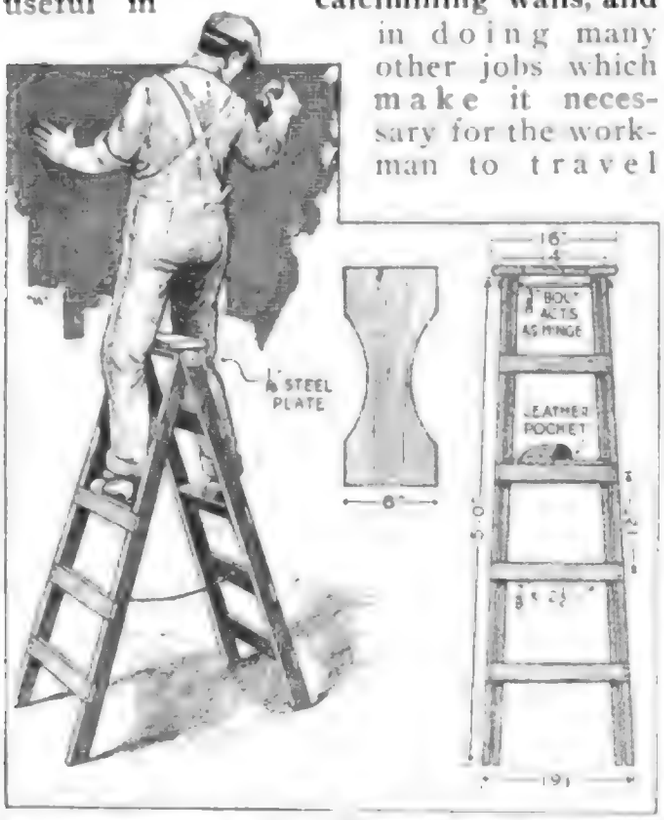
## A Walking Ladder

Though originally constructed for cleaning railroad cars, the "walking ladder" here shown has been found very useful in calcimining walls, and in doing many other jobs which make it necessary for the workman to travel




**The Advantages of a Pair of Stilts and a Stepladder are Combined in the "Walking Ladder," on Which a Workman Travels Back and Forth without Descending to the Ground**

along a distance at a fixed height above the ground. It is really a pair of stilts developed into a sort of stepladder, with a pair of flat steps, or treads, nailed against two of the rungs at the height at which the workman stands. The steps are furnished with leather pockets, by means of which the workman moves the ladder about, and hollow spaces are made at the top on both sides, as shown in the detail, so that he can bestride the ladder easily.—C. A. R., Pittsburgh, Pa.

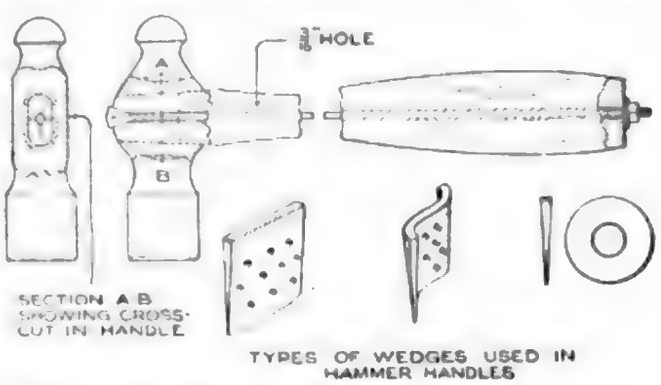
## Cutting Out Wall-Paper Borders

Wall-paper borders having curved or irregular outlines, which must be cut out by the paper hanger, require considerable time if this is done with the scissors. A quicker way of doing the work is to use a piece of wire screen, laid out flat on the paper hanger's long board. Lay the border on the screen wire; then, using an awl, darning needle, ice pick, or any such sharp instrument, trace along the outline where the paper is to be cut. The result will be a line of perforations on which the paper can be readily torn. While the outline will be a trifle rough, this will not be noticed at the distance from which it will be seen. Care should be used not to press hard enough on the pointed instrument to tear the screen wire. The easiest way to tear the paper after perforating is to cut the border into 6 or 8-ft. lengths, cover these with paste, fold in the usual way, and tear while the paper is wet with paste; there will then be less danger of tearing it wrong.

## Hammer-Handle Wedges

A number of different styles of hammer-handle wedges are illustrated in the drawing. The small views show some very simple types which have proven effective; one of these is merely a large iron washer ground thin on one edge. In the absence of any better method, such a washer is capable of holding a hammer head securely on the handle for a long time. A wedge for more permanent use is shown to the left of the washer. Such a wedge is forged from a piece of ⅛ by 1-in. soft steel. Before cutting it off from the bar, it is held in the vise while a round-nose chisel is used to cut teeth in it like those of a wood rasp. The wedge may be used flat, or may be bent into an S-shape, which gives somewhat better effect, but involves some additional work.

The large view shows a rather peculiar method which has been successfully used. With a long bit, a 3/16-in. hole is made clear through the handle from end to end. A piece of steel wire, slightly smaller than the hole, is heated at one end and upset to a conical shape. In the end of the handle which fits inside the hammer head, the center hole is countersunk to take the wedge formed on the wire. Slots




**Various Methods are Illustrated of Preventing a Hammer Head from Flying Off When the Wood of the Handle Shrinks**

are then made in the wood, at right angles to each other, and the handle is ready to be set into the head. The wedge is pulled into the wood, expanding all four forks

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of it, by a nut screwed onto the other end, which should be threaded for this purpose. The nut can be set into the back end of the handle, but it will be somewhat more accessible for tightening if left projecting, as shown, and will seldom cause any inconvenience. While the hole through the handle unquestionably weakens it somewhat, the wire adds an element of strength, and the wedge has the advantage that when the wood shrinks it can be tightened and held fast.

## Mousetrap Used as Bill File

Most mousetraps can be converted into bill files, and the simpler the construction of the trap, the less material there is to remove. Take off the trigger and leave the catch permanently closed, to act as a paper clip. Remove the bait holder and any other unnecessary part, screwing a small eye into the end farthest from the clip, so that the file may be hung up in any position desired.

## Handy Forms of Soldering Coppers for Wiring

A mechanic in an electrical repair shop uses, in connection with his work, several types of soldering iron which are useful in doing intricate jobs. One copper, about 1 lb. in weight, has a "V" cut through the side. For making end-to-end splices in stranded wiring, the wires are twisted and then laid in the V-trough of the hot copper, the flux and solder are applied, and the joint is formed by rotating the wire into a strong splice. Another copper, weighing 1½ lb., has a cavity in one side made by a large drill. This is used for soldering twisted ends of wires into a shape suitable for holding in a terminal post. The wire ends, coated with flux, are dipped into the melted solder in the cavity, and are thus joined together with great strength.

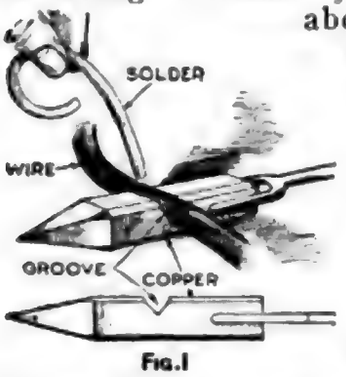


Fig. 1

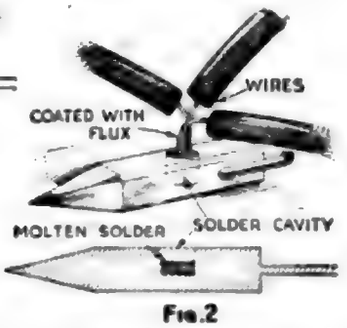
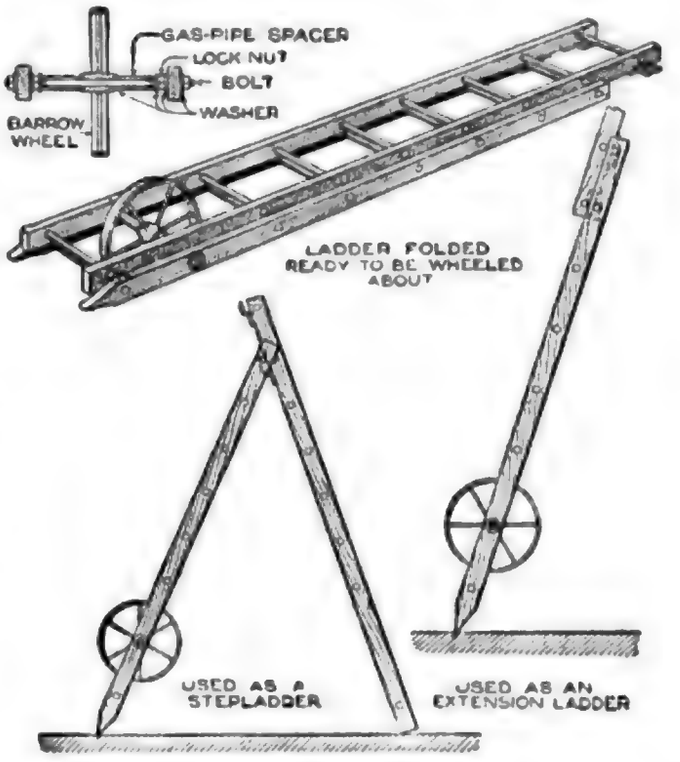


Fig. 2

In Shops Where a Great Deal of Soldering of Electric Wires is to be Done, Time may be Saved by Hollowing Out Two Heavy Coppers to the Shape Indicated

## Handy Combination Ladder

Where storage space is valuable, it is bad management to keep three varieties of the same article, if it is possible to get along with one; but whether on the farm or in a private residence, there are occasions when ladders of different kinds are needed. A long ladder is of little use indoors, and a short one is often useless out of doors because of its limited range; there are also occasions when a stepladder is indispensable. All these cases are taken care of by the ladder shown in the illustration, and most of the details of its construction appear in the top left-hand corner. It is so easy to make that any amateur can adapt the method to the conditions under which he wishes to use it.—A. B. Nutting, Boston, Mass.



Little Storage Room is Needed for This Adaptable Ladder Which can be Used for Low or High Elevations, and, When Necessary, as a Stepladder

## Book Supports Made from Bricks

To make a row of books stand upright on a table or desk, it is usually necessary to have a bookstand of some kind, or to place a weight at each end of the row. To use as weights, coat two bricks with glue, and cover them with felt, or, if the desk is an elaborately made piece of furniture, plush or velvet will harmonize better with its appearance. The weights can then be laid on polished surfaces without harming the finish.—A. C. Lattner, Urbana, Ill.

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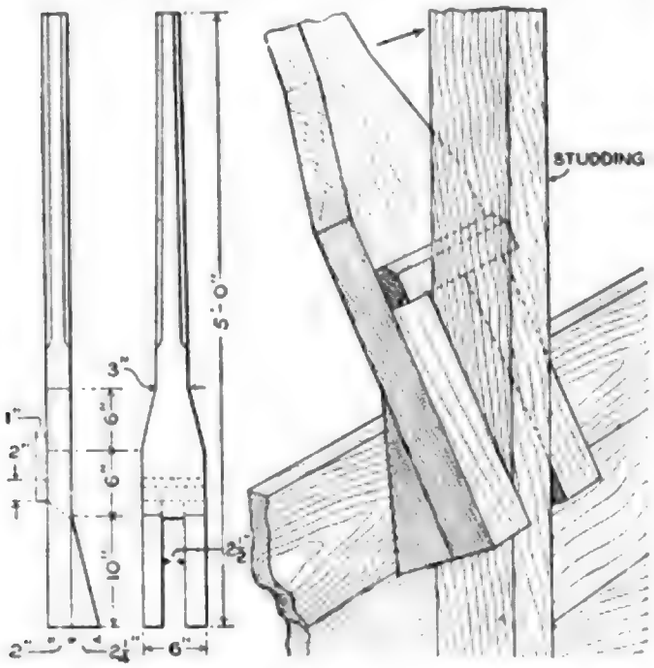
### Forked Crowbar Pulls Up Flooring

The drawing shows a pry bar which is very useful for removing roof boards, siding, and sheathing, or taking up flooring. The advantage is not only in the time




With a Tool Made from a Plank and a Few Blocks Flooring, Siding, or Sheathing is Readily Loosened from the Joists or Studding

saved, but in preserving the lumber without splitting. To make the tool, an ordinary plank is used; a slot is cut in one end, and the bottom of it is beveled as indicated. Two wedge-shaped blocks are nailed on the upper side of the fork ends, and a small block of hard wood is nailed on the underside, just behind the slot, as a fulcrum. The other end of the plank is dressed down to a convenient shape for use as a handle. The tool can be made in a very short time.—Jas. B. Clay, Jr., St. Clair Flats, Mich.

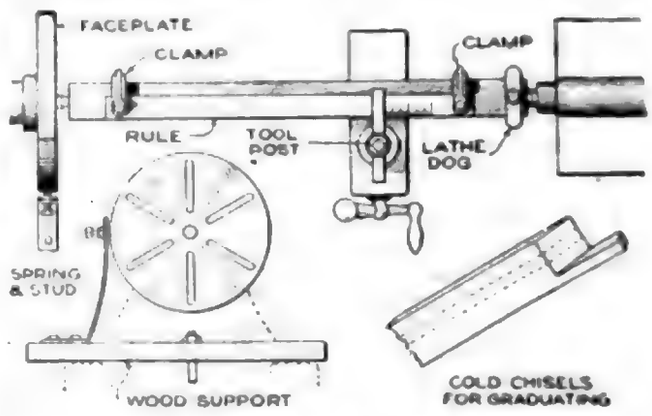
### Straightening Casehardened Steel

It is a mistake to use force in straightening a bent piece of casehardened steel, as there is some danger of cracking it. Instead, heat it slightly, place it in a vise, and where it is most noticeably out of line, drop water on the outer surface of the curvature. The material will contract along this surface, so that the piece will become straighter, although reheating may be necessary before it is completely straight. If pieces of wood are placed between the metal and the jaws of the vise, the steel will have greater freedom in returning to its original shape.—Dale R. Van Horn, Lincoln, Neb.

### Graduating a Rule on a Lathe

Occasionally a rule is required with special graduations, as thirds, fifths, sevenths of an inch, etc., with multiples of these "odd" divisions. Sometimes a machine is made that requires a divided scale attached to it, or perhaps the mechanic would like to make a rule just for the satisfaction of having one "homemade." Whatever the reason for making the rule, if one possesses a screw-cutting lathe, the graduating is very easily accomplished in the following way.

Secure a rather heavy iron bar, about 1¼ in. square and 30 in. long; center and countersink it for the lathe centers. Put a lathe dog on one end of the bar, and mount between centers with the dog at the tailstock end of lathe. Fasten the tail of the dog to the tailstock firmly, so the bar will not move when the lathe spindle is revolved. Clamp the material from which the ruler is to be made on the top surface of the square bar, flush with the edge nearest the tool post of the lathe. It must be clamped firmly so as not to move while the graduating is being done. The material should be several inches longer than the rule is to be, and the ends carefully finished off to the end marks after graduating. The small bar held in the tool post should just clear the surface of the rule. It is used only as a guide, against which the cold chisels




The Common Screw-Cutting Lathe can be Made to Give Service as a Dividing Engine, for Graduating Scales

are held when marking the graduations; it should be exactly at right angles to the rule. Below, to the left, is shown a stop to hold the faceplate and spindle at the same position every revolution. To the right is represented the style of cold chisels used, which are made in different widths, as suggested by the dotted lines. From three to five widths are required to give the different lengths of lines on ordinary steel scales.

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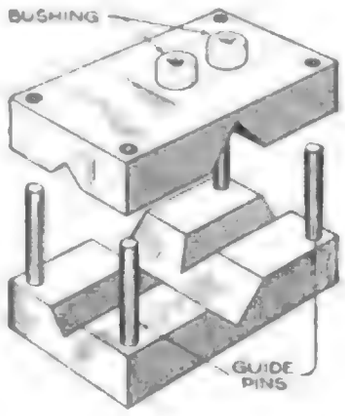
**To operate,** assemble as shown, set the gears to cut, for instance, a 32-pitch right-hand thread, throw in the threading nut, and when the carriage has moved up to the proper place, hold the widest chisel firmly against the right-hand side of the piece of steel in the tool post, with the projection against the edge of the rule, and strike it a light blow with a hammer. Pull the spring away from the faceplate until the stud is disengaged from the slot, and revolve the spindle one revolution, when the stud will snap into place again. The next graduation mark is then made, but this time with a narrow chisel. Proceed with other graduations, using the proper chisels to get lines of the correct length, and endeavoring to make the force of each hammer blow proportional to the width of the chisel. The setting described will give a graduation of thirty-seconds. A 27-pitch thread setting will give a graduation in twenty-sevenths, or if the lathe is revolved three times between each "cut" a graduation of ninths will be secured. Similarly, a 28-pitch setting can be used to mark sevenths, fourteenths, or twenty-eighths.—Harry G. Fesenfeld, Black Earth, Wis.

## Drill Jig for Round Stock

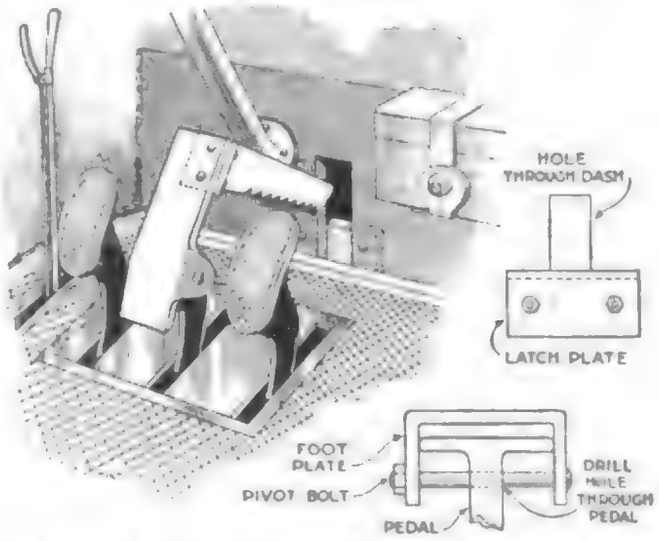
In any machine shop, toolroom, or experimental room, it is often necessary to drill a hole, or a number of holes, at right angles through the axis of round rods or cylindrical parts. The fixture illustrated in the accompanying drawing was designed to simplify this operation, and at the same time assure a hole drilled accurately through the axis of the piece.




The fixture consists of two rectangular blocks having a 90°-groove milled through their adjoining faces, or better, two grooves milled to different depths, in order to accommodate a wider range of work. The guide pins are a press fit in the lower block, but slide freely in the upper one. A set of removable hardened bushings are used, each for a certain size of drill. This is a simple fixture to make, and has more than saved its cost in the shop where the writer saw it.—Henry B. Graves, Jr., Rochester, N. Y.

## Low-Speed Latch for Auto Pedal

In using a car with planetary transmission, it was found wearisome to keep the low-speed pedal down by foot pressure when driving uphill or traveling through sand or mud. The pedal was therefore equipped with a piece of ¼-in. sheet steel, with ears, or flanges, on both sides, by means of which it was pivoted on a small pin fitted through a hole drilled in the pedal just below the pad. A long piece of ¼-in. sheet steel, with a number of




**By Means of a Toothed Plate the Low-Speed Pedal of an Automobile is Held Down without Pressure from the Driver's Foot**

teeth at the end which engage a steel lip screwed to the car dash, was fitted to the back of this member. The saw-tooth edge engaged the lip, ratchet-fashion, regardless of the wear on the lining of the band which the low-speed pedal tightens around the drum in the transmission.

To engage the teeth, the driver pushes the pedal forward until the car is on low speed, and then, with an upward movement of the knee, he causes the teeth to engage. To release the pedal, the pressure is applied on the portion of the plate just below the pivot, so that the teeth rise and disengage. When driving under ordinary conditions, the driver's foot prevents the teeth from dropping to the level of the lip, and if he wishes to travel on low speed for a few minutes, he presses the pedal forward in the usual way; but whenever he finds it necessary to travel for a considerable distance on low speed, the teeth are allowed to fall, thus engaging the lip.

¶ The asphaltum paint used on stovepipes is an excellent substitute for the preparations usually applied to automobile engines for renewing the finish.

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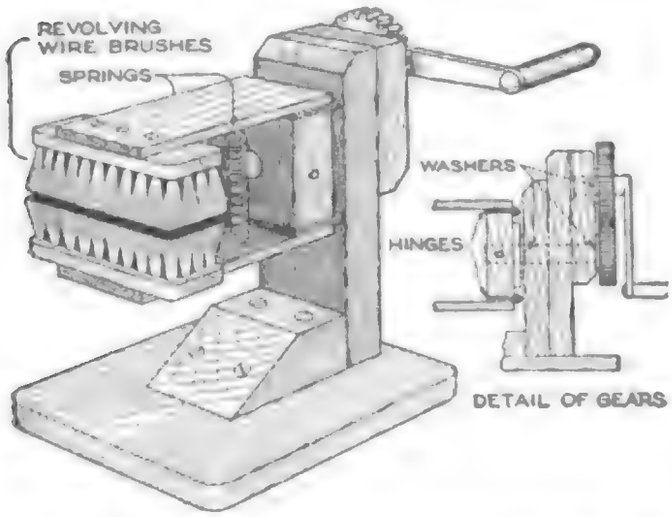
### A Wire-Brush Potato Peeler

A stiff wire-bristle brush will remove the skin from a potato so quickly and with so little waste that it is practical to apply this method of peeling in the construction of a mechanical potato peeler. Two wire brushes are mounted on a revolving head, which is driven by a geared




**Time and Food are Both Saved by Peeling Potatoes with Wire Brushes, Which are Operated by Simple Machinery**

handle, the gears being adjusted in such a ratio that the brushes revolve faster than the handle. The potato is held between the brushes at the center, and, as they revolve, it is surrounded by a swiftly turning ring of bristles. It is evident, therefore, that only the central portion of the brushes does any work, and for this reason it is possible to economize by using only one brush, and to cut it in halves, so that one half may be used below and one above. When the machine is in operation, a fork is thrust into the end of a potato, so as to hold it between the revolving brushes while they remove all the skin except at the two ends. Then, to remove the skin on the ends, the potato is again placed between the brushes with the fork thrust into the side. The peeler should, of course, be secured to a table by a clamp, or attached permanently with screws.—C. M. VanAvery, New York, New York.

### Watch Used as Protractor

As there are 15 minutes in a quarter of an hour and 90° in a right angle, the minute marks on the circumference of a watch dial are 6° apart. A watch can therefore be used as an emergency protractor, on jobs where great accuracy is not necessary.

### Cheap Dinner Bell for the Farm

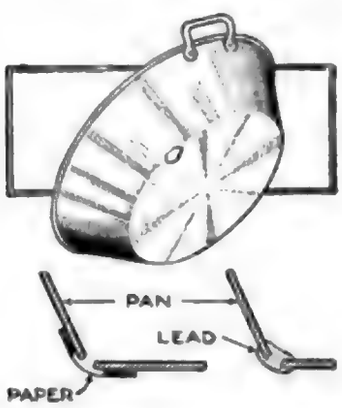
Hang a steel plowshare by a wire so that it can vibrate freely, and strike it with a bolt or other piece of metal. The sound produced is penetrating enough to be distinctly audible half a mile away—a fact which has occasionally restored discarded plowshares and moldboards to usefulness as dinner bells. A chilled-iron plowshare can also do duty as a bell, but the sound is not nearly so distinct as when steel is used.—H. S. Norris, Sebastopol, Calif.

### Chimney Cleaned by Firing Gun

If a deposit of soot prevents a chimney from drawing properly, the obstruction can be easily removed by disconnecting the stovepipe and firing a blank cartridge up through the hole. The force of the expanding gases dislodges the soot, which at once pours down the chimney. To prevent it from soiling furniture, the hole should be covered with a board immediately after the explosion. When all the soot has collected at the foot of the chimney, remove it with a fire shovel or large spoon.—Mrs. Edwin J. Bachman, Fullerton, Pa.

### Repairing Leaks in Enameled-Iron Vessels

The sketch shows how an enameled-iron pan, which had a large hole in the bottom, was repaired. Small circular holes can be readily filled by inserting a small piece of lead and riveting this carefully. This being a large hole of irregular shape, it was necessary to proceed in a different way. On the outside of the pan were glued several thicknesses of paper, with a hole cut out in the center of each, a little larger than the hole in the pan. Then a piece of paper, without the hole, was glued over this, thus forming a mold for the lead, which was poured from the inside of the pan. Enough lead should be applied to form a head on the inside similar to that formed on the outside by aid of the paper mold.—A. J. Viken, Waterloo, Ia.

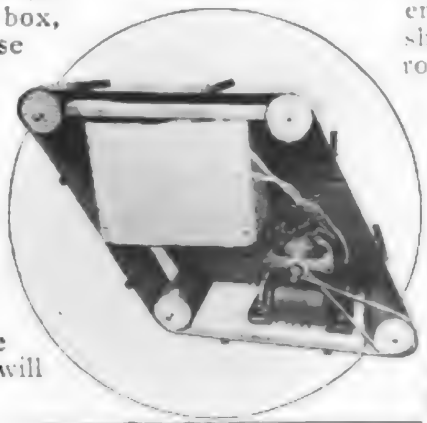


# A Toy Fighting Tank

By B. F. ENTLER

ANY lad can readily construct this toy tank, and will get endless fun from watching it crawl over rough ground, climb over obstructions placed in its way, push itself through brush and twigs, or span tiny trenches in its path.

The ordinary cigar box is about 8 by 6 by 2 in., and a box that is well constructed should be selected. With a saw, cut off two opposite corners of the box, in each case removing a triangular corner, 2½ by 5 in. in size. This will begin to show the tank's shape. Probably the cover of the cigar box will need three or four extra nails to hold it in place securely while sawing out the corners.



A Cigar Box, a Few Pieces of Broom Handle, a Toy Electric Motor, and Some Flash-Light Cells Form the Principal Materials for a Toy Tank Which Propels Itself over Rough Ground in a Manner Very Similar to That of the Great "Land Battleships"

Cut from a piece of round wooden stock, about 1 in. in diameter, four rollers, each 2 in. long. A broom handle will serve nicely for this purpose, or an old curtain pole will do just as well. The purpose of these rollers is to fit on a shaft in each corner of the frame of the tank, to act as pulleys over which the belt will pass. To make room for the rollers, it will be necessary to remove from the frame the ends of the box that have not already been sawed away. Also cut away 1 in. of the top and bottom of the frame where the rollers will be. This will allow the rollers to fit in beyond the ends, on a level with the outer edges, just right to carry the belt. The photograph in the circle shows the position of the rollers.

When the frame has been cut, one side of it should be removed in order to place the machinery inside. The photographs show this side still removed, in order that the machinery may be seen. Two small finishing nails, driven through the corners of the frame and into the center of the ends of each roller, form the shaft upon which the rollers will revolve. A thin leather or canvas belt, 2 in. wide by 25 in. long, is fitted over the four rollers. In order to keep the belt from slipping, the surfaces of the rollers may be well rubbed with resin. The outer surface of the belt is provided with a number of treads, glued in place, in order to give friction enough so that when the power is applied, the tank will be carried over the ground, or even up a slope, if the motor is powerful enough.

A small electric motor, about 3 in. high, is screwed to the lower right-hand corner of the frame, its position being 2 in. to the right of the center of the base, in order to give plenty of room for the battery. The belt pulley of the motor is connected with the nearest roller, using a small cord or piece of fishline for the belt.

The battery to furnish the electricity



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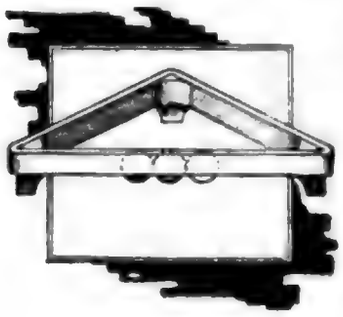
is held in the box secured to the upper part of the tank's frame. The battery box is made from thin wood, like the material in the cigar box, and is 3 by 2 by 2 in. Small screws hold it in place. The battery consists of several tubular flashlight cells, with connecting wires soldered on, or held in contact by wire springs. A switch should be located somewhere in the frame, convenient to turn on the current.

When the mechanism has been located in the frame, nail on the side that was removed. This side helps hold the rollers in place like the other side. When the current is turned on, the motor drives the rollers, and these cause the revolving belt to move the tank over the ground.

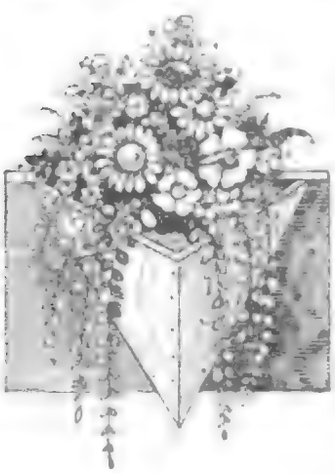
### Elevating the Pool-Ball Rack

The ordinary triangular racks used for arranging the pool balls in position to start the game have to be made somewhat loose, and some dexterity is required in lifting the rack so as not to disturb any of the balls. The illustration shows a rack in which the corner blocks have been lengthened, so as to hold the rack at a distance above the table equal to one-half the diameter of the balls. Only the lower edge of the rack then comes in contact with the balls, and the rack can be made a considerably tighter fit, at the same time eliminating almost all the likelihood of moving the balls when withdrawing the rack.—M. E. Duggan, Kenosha, Wis.



### Flower Pockets on Fence

A wall pocket to hold a plant can be easily made out of the corner of an old box. It consists of three triangular pieces—two for the sides and one for the back. The sides are, of course, cut from the box without being separated from each other. Several of them nailed to a fence, and each filled with a growing plant, present a very pleasing appearance, and as four pockets may be made from each box there is no trouble in matching them. In cutting the box, the saw should be held at an angle of not more than thirty degrees to the vertical.—Mrs. Grace E. Willey, Concord, N. H.



### Ink Impressions of Leaves

An alternative to pressing leaves, flowers, and ferns in a specimen book is to make impressions of them on white paper, with black ink. Lay the leaf flat on white paper, and spray the edges with the ink, by means of an ordinary atomizer, holding this near the paper when working at the outline of the subject, and drawing it to a distance when making the outer part of the background. In this way a sharp, black contour is obtained, with the dense shadow fading into a vignette effect at the outside.—Dale R. Van Horn, Lincoln, Neb.

### To Keep Shoe Polish Soft

When shoe-polishing paste is half melted it is much easier to apply, as there are no solid lumps to break up, and the substance is quickly spread in a thin layer over the leather surface. To keep the paste in this condition, so that it may be used at any moment, place it on the valve wheel of a steam radiator. Here it will not be in the way, yet can be conveniently reached when needed.—Harold E. Benson, Boulder, Colo.

### Bottomless Pocket for Fountain Pen

A shirt pocket which is too shallow to carry a fountain pen in an upright position can still be used for that purpose, if a small horizontal slit is made near the bottom of the pocket in one corner. The slit should be about half an inch long, and the edges should be stitched or hemmed, to prevent the material from raveling. The top of the pen is fastened to the rim of the pocket with a clip, in the usual way, and the lower end protrudes through the hole. If the pocket is to contain other articles beside the pen, it should be stitched vertically, to separate the pen compartment from the remainder of the pocket, so that objects will not fall through the hole made for the pen. —Thomas D. Baker, Butte, Mont.

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### Inflating Small Balloon with Hydrogen

A toy balloon will rise if filled with hydrogen, which can be made by combining zinc and sulphuric acid. Place a few pieces of zinc in a strong glass bottle and pour into it a mixture of sulphuric acid and water, containing about five parts of water to one of acid. (In making this mixture, pour the acid into the water; never the water into the acid.) Through the cork of the bottle pass a glass tube, and tie the empty balloon to the upper end with thread. Then make the cork tight in the neck of the bottle and the pressure of the gas generated by the zinc dissolving in the acid will cause the balloon to swell When it is full, tie the opening with thread above the glass tube, and release the balloon.—B. R. Corse, Irvington, N. J.

### Garden Seat Mounted on Stump

As the picture shows, a very presentable garden seat can be built from the seat of a discarded buggy. The upholstery is to be ripped off, all projecting nails and tacks are most carefully removed, and such iron members as were part of the seat in its better days are again securely screwed in place. The bottom will be the weak part for garden use. Reinforce this with 1-in. or even 2-in. lumber, if such planks can be found. Fit the bottom in carefully, and let it take the place of the discarded cushion.

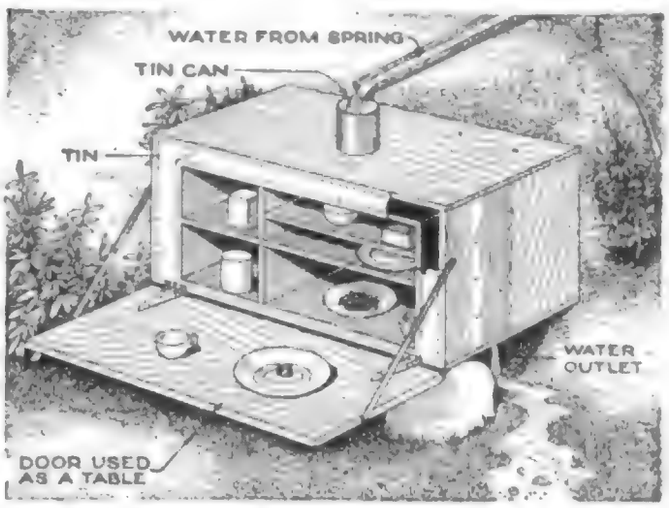
**The Seat from an Old Buggy was Mounted on a Stump and Made to Give Service as a Garden Seat**

In the illustration the seat is shown mounted on a stump, though it would be easy to provide it with legs; the ingenuity of the builder will suggest the most practical way for his own needs.—C. L. Meller, Fargo, N. D.

¶Sand scars may be removed from soft castings by dropping the casting while still hot into cold water. The resulting steam will ordinarily cause the scar to blow itself out.

### Simple Camp Refrigerator Using Spring Water

A group of campers kept their food cool while on vacation, without going to the trouble of carrying a refrigerator with their outfit. They made a cooler out of two wooden boxes which carried part of their supplies, one of them being small enough to fit inside the other, with a space of 2 or 3 in. between. A tin coating made the smaller box water-tight, and, after it had been placed in position, the




**Two Boxes are Used at a Summer Camp to Make a Water-Jacketed Food Cooler**

space between both boxes just inside the lid was covered with sheets of tin nailed to the edges, as shown in the sketch. In this way the inner box was completely jacketed, so that running water from a neighboring spring could act as a cooling agent, being conveyed along a grooved pole to a hole in the outer box, where a tin can served as a funnel. Both the top and bottom of the can were removed, so that fresh air, cooled by the water, could be kept circulating freely between the boxes. Shelves inside the smaller box kept the articles of food separate, and the hinged lid of the outer box served as a table or sideboard. The cooler rested on stones, about 4 in. from the ground, and the water escaped through holes bored in the larger box. Iron or lead pipe could be used to convey the water; the pole was used merely on account of its being lighter and easier to carry.

### To Preserve Polish of Nickel

The banana oil that is mixed with powder to make bronze or aluminum finish can be used separately to protect nickelplated surfaces from rust. It does not dull the brilliancy of the plating, and is impervious to damp.

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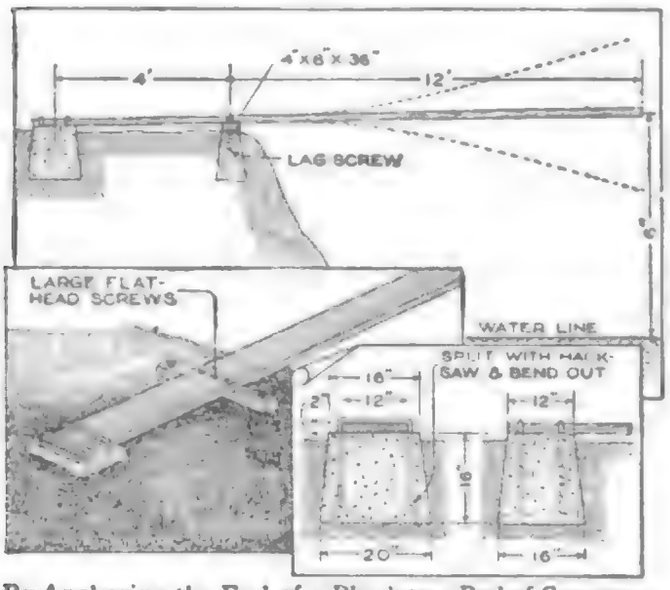
### Spring Board for the Swimming Pool

A river or lake with natural facilities for safe diving is not always easy to find. When artificial additions are made, it is practical to render them permanent, if the same location is continually visited. A spring board made according to the




By Anchoring the End of a Plank to a Bed of Concrete, a Spring Board is Made a Permanent Fixture

dimensions given in the sketch has been used for over four years, and shows every sign of lasting indefinitely. The shoreward end of it is held by staples or anchors, sunk in a concrete bed, which was made by mixing sand with a quarter of a bag of cement. The staples were cut from ⅜-in. round iron stock, being made about 45 in. in length, and bent into shape by a blacksmith. The board was varnished, and sprinkled with fine sand before the coat was dry, so that the surface would furnish a good foothold, and was set in position over a 10-ft. depth of water, so as to reduce the chance of accident. As the elasticity of the board subjected the cement to considerable strain when a man of average weight dived off the opposite end, the sides of the block were made to taper, and in this way the pressure of the earth against its sides prevented it from being loosened by the upward pull of the plank against the anchors. The wooden strip, which formed the board's central support, was fastened to it by wood screws, the holes being counterbored and filled with plaster, to prevent injury to the feet of the diver. The strip was attached to wooden blocks, cut to a shape similar to that of the concrete ones, so as to offer sufficient resistance to the upward pull of the board as it rebounded after the diver had made his plunge.—P. P. Avery, Garfield, N. J.

### Shoe Polish for Refinishing Furniture

A merchant purchased a quantity of secondhand office furniture from one of the army cantonments, and, being anxious to give it as new an appearance as possible, he had it scrubbed with soap and water. The result was not satisfactory, as, though the dirt was removed, the bruises and scratches in the varnish were whitened and emphasized, and the surface lost what gloss it had, taking on a dull and flat appearance. One day, however, while shining his tan shoes on the oak seat of one of the chairs, he accidentally stained the surface of the wood, and its appearance was much improved at the spots where the polish was rubbed in. He therefore decided to give all the furniture the same treatment. It was of the golden or light-oak variety, and the dressing used was of the ordinary oxblood shade. It was applied in exactly the same manner as in treating shoes, that is, with a dauber; then polished with a shoe brush, and given a final rubbing with a soft cloth. The polish was applied against the grain, which forced it into the wood, but was rubbed with the grain. Whatever parts had lost their finish through injury to the varnish, took just enough of the color of the polish to make them look uniform with the rest of the surface.—Harry O. Mitchell, Atlanta, Ga.

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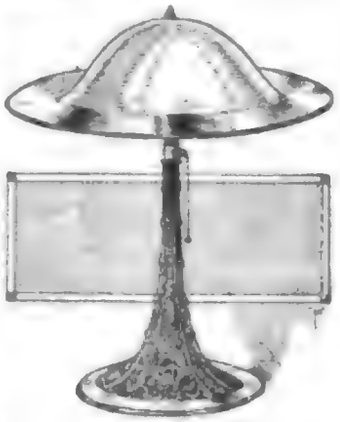
### Steel Helmet as Lamp Shade

A returned soldier made a table ornament of his helmet by turning it into a shade for an electric lamp. He stripped it of all padding and straps, and removed the rivet at the top, which was easily accomplished with a file. He then coated the inside with white enamel to give it more reflecting power, but made no change in its outer surface, as he did not wish to remove the traces of the purpose which it had originally served. Such an ornament can be given a very brilliant appearance by gilding it, or painting a design upon it; but it will be more interesting as a souvenir, if it is easily identified as a helmet. —J. W. McRae, St. Louis, Mo.



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### To Prevent Bruising Fruit

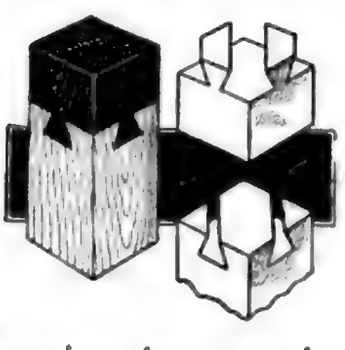
A guest at a lawn party was given a large pail of very ripe cherries to take home, but the journey meant a 40-mile drive by automobile, so that it seemed more than likely that the fruit would be bruised to a pulp. The difficulty was met by filling the pail with water and placing a piece of burlap over the top, so as to prevent the floor of the car from being splashed. The experiment proved a success, as the water acted as a shock absorber. All kinds of berries—particularly red raspberries—can be shipped in this way, and all that is necessary is to use a water-tight container.—James H. Beebee, Rochester, N. Y.

### Artistic Glass Decorations of Crêpe Paper

Table napkins of crêpe paper have been used with excellent results in covering bathroom window glass, making it translucent without being transparent. It was found to admit light, but objects could not be distinguished, so that it made an ornamental substitute for frosted glass; and as the paper was decorated with colored flowers, a very artistic effect was produced. To make the paper translucent, dip it in a solution containing one part of sodium silicate and five parts of water, and then press it upon the window while still wet. The silicate has the same effect as varnish in making the paper admit light, but does not get sticky from heat, and for this reason the process can be used in making ornamental lamp shades.

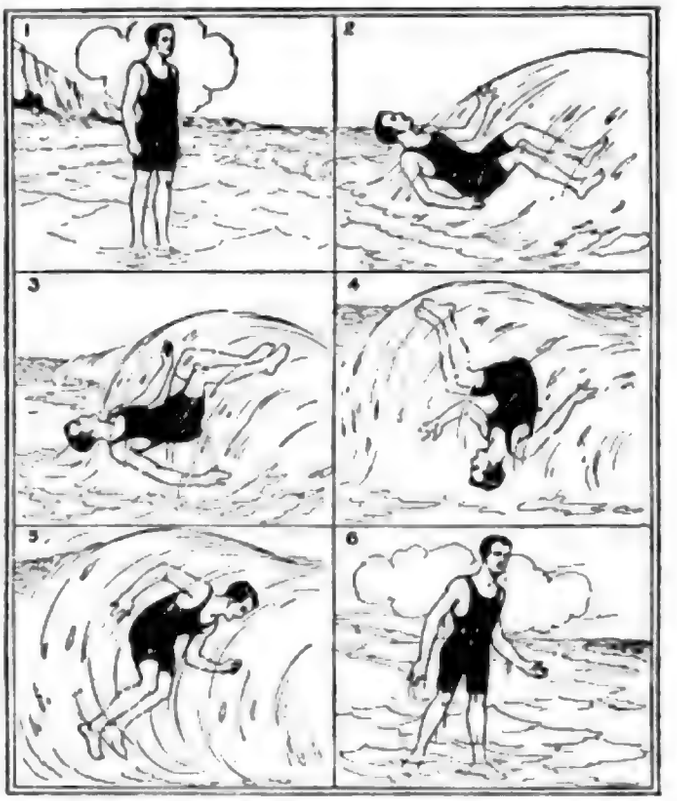
### Dovetailed-Block Puzzle

A puzzle that rarely fails to mystify can be made by any boy who is handy with a chisel. A very good effect can be gotten by making one block from some dark-colored wood, and the other from pine. The trick lies in cutting the dovetails at an angle of 45°, and putting them together to form one solid block. They can be glued together, and when shown to somebody he cannot see how it is possible to get two blocks together in that form.—Chas. A. Loyda, Milwaukee, Wis.



### Bather Curls Over in Surf

Plenty of fun and healthy exercise can be gained by turning back-somersaults in the surf while bathing. The bather wades out to the line where the breakers begin to curl, and when he is about shoulder-deep, he stands facing out to sea, with his eye on a coming wave. Just before the wave begins to lift to form a breaker, he throws himself on his back, and floats with his head toward the shore and his feet toward the sea. If he has judged the time and distance correctly, the curling breaker will pick him up feet first, turn him heels over head, and leave him standing on his feet, ready for the next wave. It takes a certain amount of practice to learn how to judge the time and distance, but there is nearly as much fun in failure as in success. Very large breakers are needed to turn a grown man, but ordinary surf will generally turn a boy.—F. H. Sweet, Waynesboro, Va.




By Practicing Back-Somersaults in the Surf, the Bather Finds a Diverting Change from Ordinary Swimming and Diving

### Mirror Aids in Shaving

In a room lighted by windows with small panes, it is possible to obtain a good light for shaving by placing a small mirror over one of the panes. The best way is to cut a mirror the same size as the pane, and fasten it in position with putty. —Paul Gorton, Big Rapids, Mich.

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# A Low-Powered Penguin or Training Plane

By F. D. Purke

A SMALL airplane which can be built with very little previous knowledge of airplane construction, and with which the rudiments of flying can be learned, is here described. The rather unusual design was adopted because it embodies, first, low cost combined with simple, robust construction, and, second, the light weight necessary to fly successfully with a motorcycle engine. The system of wing bracing is such that the wings can be easily put on or taken off in a few moments. This makes it possible to store the machine in a small space when not in use.

Principal dimensions are: 22-ft. span, 5-ft. chord, length over all 17 ft., weight empty 200 to 225 lb., weight fully loaded 375 to 400 lb. Wing section U. S. A. 3, angle of incidence 6°, power plant 10-14-hp. motorcycle engine. Total cost of materials, not including engine, should not exceed $100.

### Fuselage

The construction of the fuselage should be undertaken first. As seen in Fig. 1, this consists of two ash longitudinals, tied by spruce or white-pine struts, and braced with piano wire. The wood selected should be well seasoned, straight-grained, and free from knots, pitch pockets, and winds shakes. All parts, after being cut to shape and dimensions shown, should be given at least two coats of good spar varnish. The method of assembling is shown in Fig. 2. Turnbuckles of the type shown are used throughout the

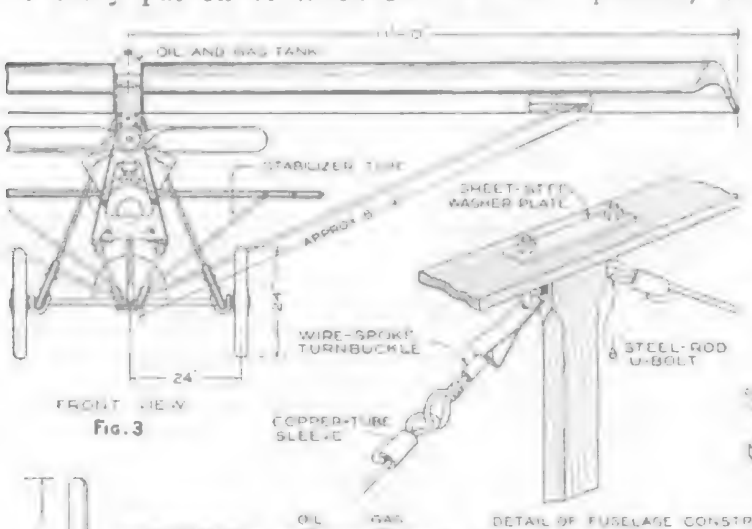
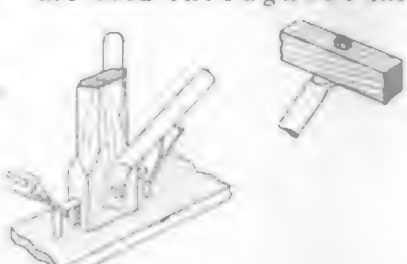



Fig. 3



DETAIL OF FUSELAGE CONSTRUCTION AND STABILIZER BRACES

Fig. 2

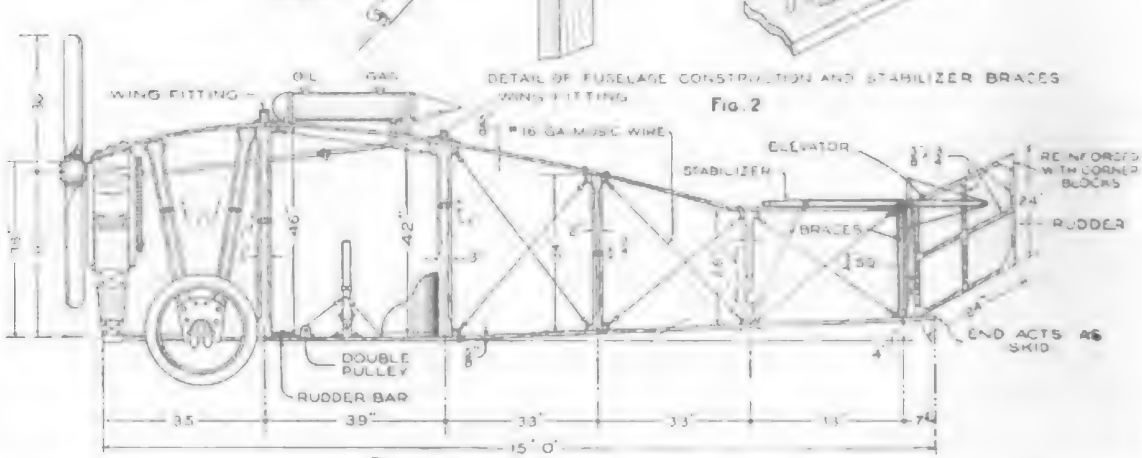



Fig. 1 SIDE ELEVATION

**Figures 1, 2, and 3 Illustrate the Construction of the Fuselage, the Position of the Pilot Relative to the Controls of the Machine, and the Arrangement of the Power Plant and Fuel Supply. The Elevated Position of the Propeller Permits the Use of a Very Simple Landing Gear.**



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machine, 26 being required. The builder should start the assembly of the fuselage from the tail post and work forward.

### Engine Mounting

The sheet-steel mounting for the engine, shown in Fig. 1, and in detail in Fig. 5, can be cut from a single sheet of metal, 72 by 36 in. in size. This should be made as close to the dimensions given as the motor used will permit; the propeller-shaft mounting will be described later. Two babbitt-lined bushings, of 1-in. inside diameter, and with shoulders on one end, are pushed through holes cut for them in the top of the flanges of the motor mounting, and into the ends of a short length of tubing that acts as a spacer.

### Alining Fuselage

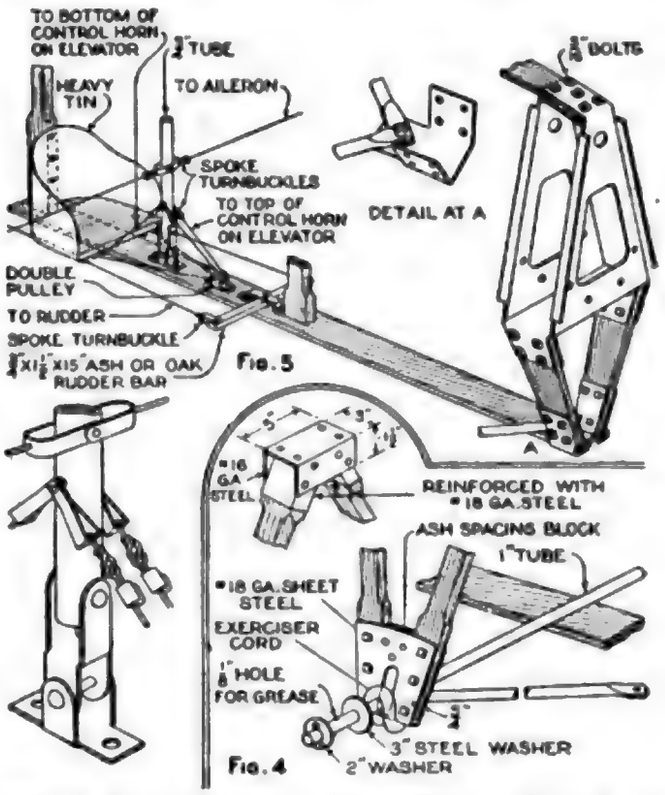
Before proceeding further, the fuselage should be carefully alined or trued up, as the handling qualities of the machine will depend a great deal upon how well this is done. The fuselage should be placed in an upright position, on a bench or plank mounted on horses. The lower longitudinal, from the engine mounting to the first strut back of the seat, should be perfectly straight. A spirit level is placed on the longitudinal just back of the engine mounting and the fuselage blocked up until perfectly level. It is then clamped firmly to the bench or planks. By adjusting the cross-bracing wires back of the seat section, the lower longitudinal can be given the amount of rise at the tail indicated in Fig. 1. When this is done, the top longitudinal between the two rearmost struts should be level. This is necessary to insure correct position of the stabilizer.

### Landing Gear

The landing gear is shown in Figs. 3 and 4. Light motorcycle wheels, 24 by 2, or 26 by 2½ in., can be used to advantage. The ball bearings should be removed, and short lengths of brass tubing forced into the tubes, to act as bushings. The tubing axle should have a small amount of grease packed into each end, and a ⅛-in. hole, drilled as shown, will provide sufficient lubrication. The shock absorbers used are of ½-in. "exerciser cord," a 3 or 4-ft. length for each side of the machine being sufficient. The struts may be formed to an approximately streamline surface.

### Controls and Steering Arrangement

The control, shown in Fig. 5, is of the well-known stick type. Moving the stick forward and backward controls the elevator; the side-to-side movement controls the ailerons. The foot bar is connected to the rudder for steering to the right or left. A light-weight bucket seat should be mounted as shown, and should




**Figures 4 and 5 Show the Simplified Landing Gear, and Bring Out in Greater Detail the Pilot's Seat, the Controls, and the Engine Mounting**

be provided with a cushion and a safety belt with a quick-release hook.

### Wings

All details of wing construction are shown in Figs. 6 to 13. The ribs are of the web-and-batten type; 26 of these will be required, six of which are compression ribs, and 20 camber ribs, so called because they give the proper shape or camber to the wings. The webs for the camber ribs should be cut, as shown, from ⅛-in.-thick spruce, poplar, or white pine. The main webs for the compression ribs should be cut from ¼-in. material and left solid; those for the camber ribs are lightened as shown. The battens, of spruce or white pine, are ⅛ by ⅝ in., for all ribs. They should have grooves about 1/32 in. deep into which the webs are glued and nailed. In making up the ribs, the top and bottom battens are first glued and nailed to the center web only. The ribs are then attached to the spars, being spaced as shown in Fig. 6. The nose and tail webs are then put into place, care being taken to get them tight against the spars, which are shaped as shown in Fig. 8, to make a close fit. The

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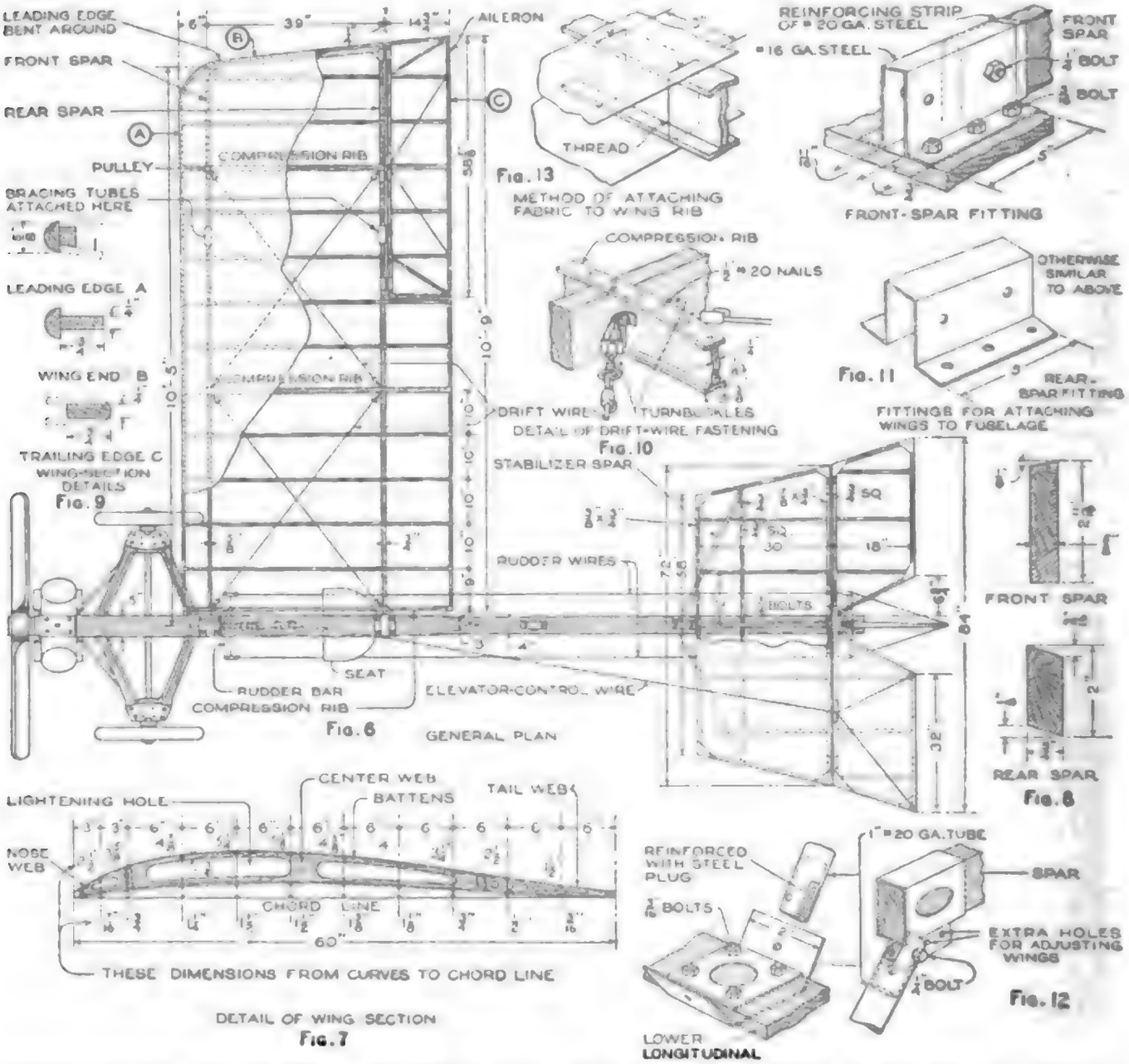
leading edge is made up of two pieces, as shown in Fig. 9. The half-round piece should be long enough to bend around the wing tip and serve as the wing endpiece, being here reinforced as shown. The drift wires, which hold the wings from collapsing, are put in as shown in Figs. 6 and 10. The fittings for attaching the wings to the fuselage are shown in Fig. 11; the location of these fittings is seen in Fig. 1. Four long tubes take the place of the usual system of bracing wires; the method of attaching these tubes to the wings and fuselage is clearly shown in Fig. 12. The correct length for the tubes can be ascertained in the following manner: Attach one wing to the fuselage, block up the wing until the outer end of each spar is 1 in. higher than the butt end. This can be arrived at by measuring the heights of both ends of each spar from the floor. With the wings in correct position, the distance from the center of the holes in the wing fittings to the center of the holes in the fuselage fittings can be measured, and the tubes made up accordingly.

### Ailerons and Aileron-Control Wires

The ailerons are of the dimensions given in Fig. 6, their construction being similar to that of the rear part of the wings. They are attached to the rear spar by hinges, as shown in the detail, Fig. 14. Two small pulleys should be attached to the front spar of each wing, at the point shown in Fig. 6, one above and one below the wing. A flexible cable should run from the top control horn of the right-hand aileron, as shown in Fig.




**Figures 6-13 Illustrate the Wings. The Wing Curve Used is Given in Detail, as Are Also the Principal Fittings, All of Which are Handmade, from Common Materials. A Plan View of the Wings, Fuselage, and Tail Appears in Figure 6**

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15, to the pulley on the front spar, across the wing, along the front spar, to the pulley on the left wing, to the top control horn of the left-hand aileron. This wire should be provided with a turnbuckle for making adjustments. From the lower aileron-control horns, wires are run to the pulleys attached to the underside of the front spars, and thence direct to the control stick, and there attached to turnbuckles, as shown in Fig. 5. When the stick is in a neutral position, the trailing edge of the ailerons should hang about ¼ in. below the trailing edge of the wings; then, when the plane is in flight, the air pressure will raise the ailerons so they will be in line with the rest of the wing. The tension of the wires should be such that a ⅛-in. movement of the stick from side to side will show a corresponding movement of the ailerons.

### Tail Group

The stabilizer, elevator, and rudder are built up of spruce, or white pine, to the dimensions and forms shown in Fig. 6. The corners are reinforced with triangular wood blocks and strips of light tin. The control horns are attached, as shown in Fig. 15, at the left fork of the horn. Hinges for the elevator and rudder are of the same type as those used for the ailerons. The stabilizer is bolted to the top longitudinal of the fuselage at points indictated in Fig. 6, and braced with four short lengths of ⅜-in. No. 16 gauge tube. The ends of these are flattened and bolted to the stabilizer spars, and to the lower end of the nearest strut, as shown in detail in Fig. 2.

### Wing Covering

The wings and control surfaces are covered with unbleached cotton sheeting. It should be put on the wings in the following manner: Temporarily tack the edge of the fabric to the trailing edge of the wing. Stretch the fabric across the top of the wing to the leading edge, back across the underside of the wing to the trailing edge, and tack. The two edges of the fabric should be sewed along the trailing edge and around the wing tip, the tacks being removed as the sewing progresses. The fabric is permanently tacked to the compression rib at the butt end of the wing and likewise along the rear spar where the ailerons fit in. It is also sewed to the ribs, as shown in Fig. 13, long upholstering needles being used for this purpose. The controlling surfaces are covered in the same manner. All surfaces, when covered, should be given two or three coats of airplane "dope," to shrink the fabric and make it air-tight. This dope is a cellulose preparation that can be purchased for

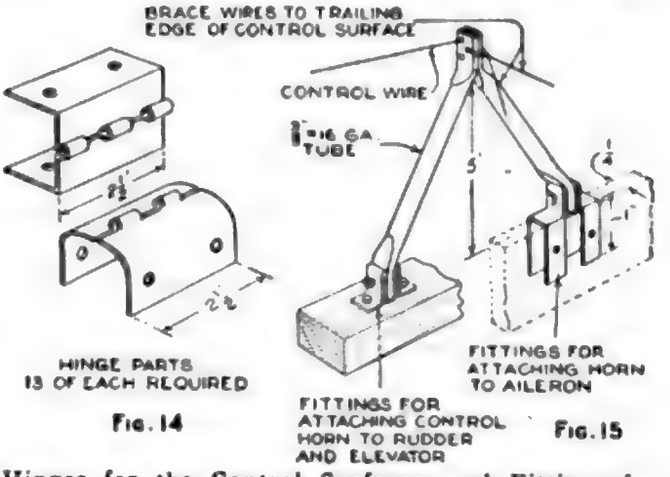


Fig. 14 Fig. 15

**Hinges for the Control Surfaces, and Fittings for the Control Horns, Are of Uniform Types, Modified in Certain Dimensions to Fit the Various Parts to Which They are Attached**

about $2.50 per gallon from any aeronautical-supply house. Four gallons will be sufficient to give the wings and tail planes two coats.

### Power Plant

A stock twin-cylinder motorcycle engine is mounted as shown in Figs. 1, 3,

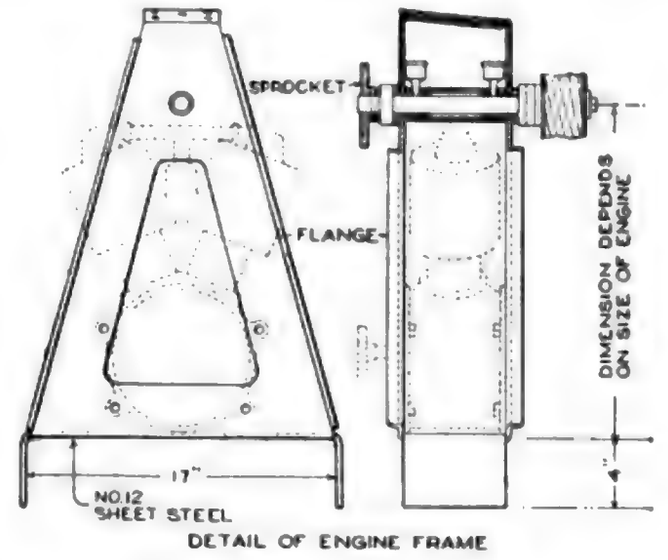


Fig. 16

**The Propeller is Simply Mounted on a Short Shaft, Which Works in Well-Lubricated Bearings, and is Driven by a Motorcycle Chain**

and 5. The propeller is mounted as shown in the detail, Fig. 16. Ordinary motorcycle chain is used. The propeller should be 5 ft. in diameter, and 4 ft. in pitch, with a

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blade width of 5 in. A good propeller of this size will absorb power as follows: 9 hp. at 1,200 r. p. m.; 10 hp. at 1,250; 13 hp. at 1,325; 14 hp. at 1,375, and 16 hp. at 1,440 r. p. m. A gasoline tank of about 1½-gal. capacity should be mounted on the top longitudinal, as shown in Fig. 1. The spark and throttle lever should be attached to the seat and connected to the motor, preferably by Bowden wire.

### Self-Training

For flying, a field, with at least one mile of straightaway, and half of a mile wide, is desirable. The first step for the student to learn is to manage his engine and steer with his feet. The setscrew on the throttle of the carburetor should be set so that the propeller will turn between 800 and 900 r. p. m. This will give the machine sufficient speed to make the rudder operative, but not enough to "get off." The plane should be started off down the field with all the controls in neutral position. Any tendency of the plane to swing off its course should immediately be counteracted by the use of the rudder. Sudden half turns to the right or left, sometimes called "pinwheeling," can be counteracted only by throttling the motor. To put the plane back on its course, the rudder should be put hard over, and the throttle opened and closed several times. The machine will gather momentum slowly, while the jerky blasts of air from the propeller acting on the rudder will swing the plane back on its course. When the student can "taxi" about under perfect rudder control, the motor should be speeded up so the propeller will turn 1,150 to 1,200 r. p. m. He is now ready for his first "hop." He should start out with his elevators slightly deflected, and run along with the tail well up, until maximum speed has been acquired. Then, gently pulling the stick back, lift the machine 2 or 3 ft. from the ground, and push the stick back to a neutral position. The hop should be continued for 100 yd. or so. Slight throttling of the motor will cause the machine to settle gently back to the ground. When the student has acquired considerable skill in making these hops, he is ready to use the full power of his motor. Allowing the machine to climb to a height of 8 or 10 ft., he gradually extends the length of his straightaway to a half mile, or more. In landing, bring the machine down to within 4 or 5 ft. of the ground before throttling the motor. Then, as the machine loses flying speed, gradually pull back on the stick to keep it from settling too rapidly.

So far, no mention has been made of the ailerons, as their use is not called for in straight flights, in calm weather. Their effect should be gradually tested out before attempting flights at any greater altitude, or making circles.

Circles should, in fact, not be attempted with a "penguin" machine of this type, unless it can be held well up off the ground with the motor slightly throttled. The altitude should be not less than 50 or 100 ft. before attempting circles or half circles, and they must be wide, without perceptible banking.

When the student has mastered the possibilities of this light training plane, he should be ready to study, in a full-powered machine, the more advanced art of flying.

### MATERIAL REQUIRED

(White pine may be used instead of spruce.)

2 pieces of ash, ⅝ by 5 in. by 16 ft. 6 in.
1 piece of ash or oak ¾ by 1½ by 15 in.
1 piece of spruce, ¾ by 2 in. by 7 ft.
1 piece of spruce, 1 by 3 in. by 8 ft.
4 pieces of spruce, ⅞ by 3 in. by 4 ft. 6 in.
4 pieces of spruce, ¾ by ⅞ in. by 6 ft.
10 pieces of spruce, ⅞ by ¾ ft. by 5 in.
2 pieces of spruce, ⅝ by 2¾ in. by 10 ft. 6 in.
2 pieces of spruce, ¾ by 2 in. by 11 ft.
2 pieces of spruce, ¼ by ¾ in. by 11 ft.
2 pieces of spruce, half-round, ⅝ in. by 15 ft.
2 pieces of spruce, ¼ by ⅜ in. by 10 ft.
20 pieces of spruce, ¼ by 6 in. by 5 ft.
6 pieces of spruce, ¼ by 6 in. by 5 ft.
60 pieces of spruce, ⅛ by ⅝ in. by 5 ft. 6 in.
1 piece of spruce, 5/16 by 6 in. by 4 ft.
2 pieces of spruce, ¾ by 4 in. by 2 ft.
1 piece No. 10 gauge sheet steel, 4½ by 9 in.
1 piece No. 12 gauge sheet steel, 3 by 6 ft.
1 piece No. 16 gauge sheet steel, 1 by 4 ft.
1 piece No. 18 gauge sheet steel, 1 by 4 ft.
1 piece No. 20 gauge sheet steel, 6 by 18 in.
4 pieces No. 20 gauge seamless steel tubing, 9 ft. long, 1 in. outside diameter.
4 pieces No. 16 gauge seamless steel tubing, 4 ft. 6 in. long, ¾ in. outside diameter.
4 pieces No. 16 gauge seamless steel tubing, 4 ft. long, ⅝ in. outside diameter.
1 piece No. 18 gauge seamless steel tubing, 24 in. long, ⅞ in. outside diameter.
1 piece No. 16 gauge seamless steel tubing, 10 ft. long, ⅜ in. outside diameter.
1 piece No. 18 gauge seamless steel tubing, 10 in. long, 1⅛ in. outside diameter.
1 piece No. 14 gauge seamless steel tubing, 5 ft. long, 1 in. outside diameter.
1 piece No. 18 gauge copper tubing, 5 ft. long, ¼ in. outside diameter.
2 lb. of No. 16 gauge music wire.
100 ft. of 3/32-in. cotton-cored flexible cable for controls.
5 small pulleys.
30 motorcycle spokes.
1 qt. glue.
12 yd. of 60-in. wide unbleached cotton sheeting.
1 pair of motorcycle wheels.
1 propeller.

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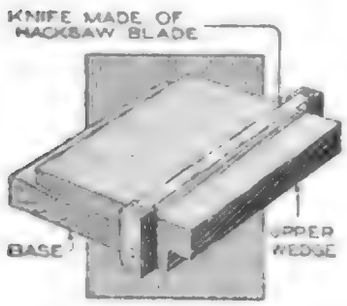
### Keeping Water Cold in a Canteen

The contents of a canteen can be kept cool by keeping moisture in the burlap cover. To insure this, punch a ¼-in. hole in the canteen near the screw top, and insert enough soft cotton twine to plug it, taking care that the twine is long enough to reach to the bottom of the canteen on the inside, with 2 or 3 in. projecting. Divide the twine into strands on the outside, and thrust them between the burlap cover and the canteen in different directions. They will draw enough water from the canteen to keep the cover moist.—C. R. Terrell, Grafton, Calif.

### Adjustable Vegetable Slicer

The drawing shows a useful little device for rapidly cutting vegetables into even slices. The knife is made of an old hacksaw blade with teeth removed, ground to a sharp knife-edge, and fastened to the tops of two small blocks, which are in turn fastened to a wedge-shaped base. The upper wedge is a block of similar taper. Sliding one upon the other will vary the thicknesses of the slices cut. A single heavy wood screw from the underside clamps the two blocks together. A slot is cut in the base for the screw to slide in.—Jas. P. Lewis, Golden, Colo.



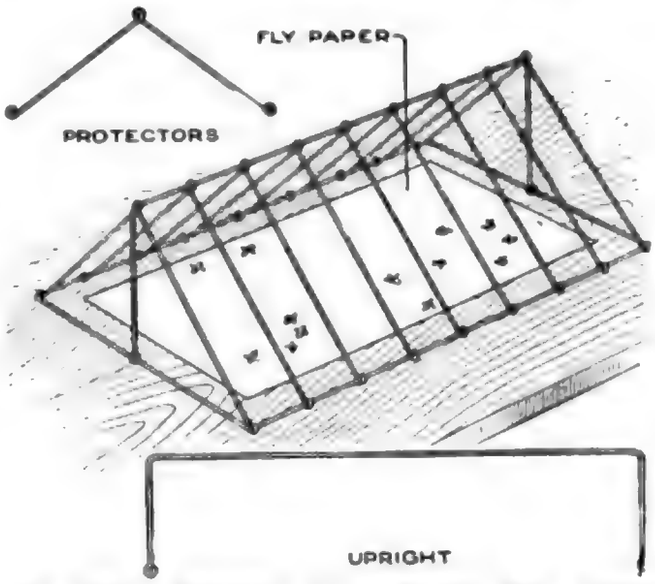

### Safety Pin Repairs Coffeepot

Occasionally a coffeepot is thrown away merely because the hinge pin of the lid is lost. A small safety pin is an excellent substitute for the rivet.

¶A simple but effective method of making a fuse wire is to bore a hole into a piece of lead with a ⅛-in. twist drill. The long, curled strip of lead which comes out of the hole is used for the wire; if it is not found heavy enough, a thicker one can be obtained by exerting greater pressure on the drill, or using a larger one.

### Sticky-Fly-Paper Guard

There are few households which have not felt the need of a fly-paper guard, and it is surprising that some appliance of the kind shown in the sketch is not more

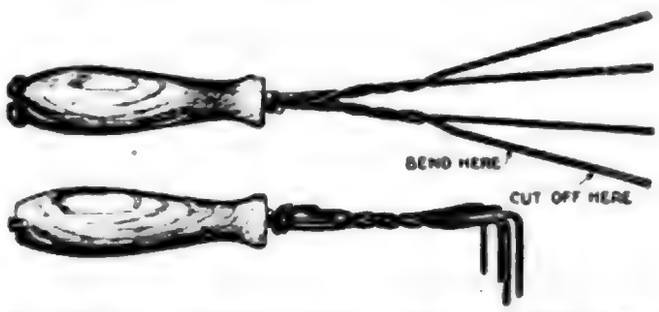



**Fly Paper Protected by a Simple Wire Guard Is as Effective in Catching Flies as When Completely Exposed**

generally used. It is easy to avoid the annoyance of laying a hat or other article on the sticky paper in a dark room, and a few pieces of wire fastened together in the form of a cage with gable ends will give all the protection necessary.—Arthur J. Kelly, Brooklyn, N. Y.

### Weeder Made from Carpet Beater

When a wire carpet beater is broken, it can still do good service as a weeder. Cut off the ends of the wires about 6 in. from the handle, bend them as shown, and




**An Old Carpet Beater is Changed into a Light Weeding Tool, Which can be Used More Handily Than the Hoe for Delicate Work**

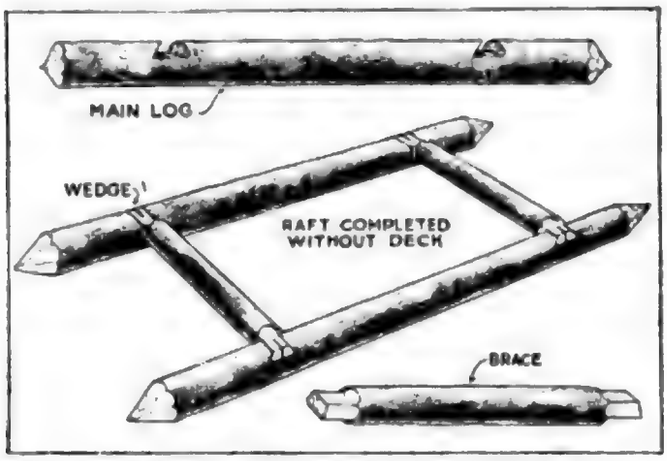
the result will be an excellent weeder for house plants and hotbeds, or even for the kitchen garden.—Milo L. Curtis, Bloomington, Ind.

¶A trunk strap was wound over the hole in a blown-out casing before inflating the tire, and proved very effective.

### A Woodsman's Raft without Nails

An ingenious method of building a raft, without using either nails or ropes, has saved many a woodsman a long and tiresome journey around a lake. The only tool needed is an ax, which must be used with reasonable skill.

Two logs are cut, of desired length and size, and rolled to the water's edge. In each of these are cut two notches, about two feet from either end, and wider at the bottom than at the top. Two stout




**The Skillful Woodsman Builds a Raft without the Use of Metal, and with No Other Tools Than His Ax**

braces are then cut and shaped at the ends to fit the notches. One end of each brace is thrust into the notch of the same log and driven in tight. The other ends are worked into the notches of the other log, usually by shoving the log against them, fitting the ends to the notches, and forcing home with a lever.

When the braces are both in tight and projecting beyond the logs, wooden wedges are driven into their ends, spreading them in the notches and making the whole tight. A deck is made by laying on lighter crosspieces, flattened with the ax, and fitting similarly into shallow notches in the tops of the logs. The ends of the logs are often sharpened to give better headway. If more strength is needed, another brace may be used, or even several if the raft is long.

A good axman can build a raft of this kind in little over an hour.—Geo. P. Melrose, Vernon, B. C.

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### Tree Crickets as Thermometers

In August, when the nights are hot, and during the first cool ones of September, people who live in the country can tell the temperature by the constant and regular chirping of the tree crickets. These little creatures are nature's thermometers. When the temperature is high, they chirp fast; when it falls, they chirp more and more slowly, until at about 50° F. they cease entirely.

Here is a rule that gives a fairly accurate relation between the temperature and the rate of chirping: The number of chirps in 15 seconds, plus 40, equals the approximate temperature, Fahrenheit.

It is interesting to get a few of these "live thermometers" and watch them. They are generally to be found on grapevines and apple trees, but to catch them one must be very quick. Their pale-green bodies are about half an inch long, and are covered by gauzelike wings with green veins. When disturbed in their haunts they stop singing, and often several minutes will pass before they resume it. When one is discovered, just clap both hands over the leaf on which it is resting.

A large wire-netting cage is a good place to keep them in, because it can be removed from place to place, into different conditions of temperature and moisture. If they are to be kept more than a few hours, fresh leaves should be placed in the cage. When all is still, they will begin to chirp. All in a group will chirp at the same time and at the same pitch. Try some in a warm place and others in a cool one. They hold their bodies at right angles when chirping.—J. W. Wolfe, New York, N. Y.

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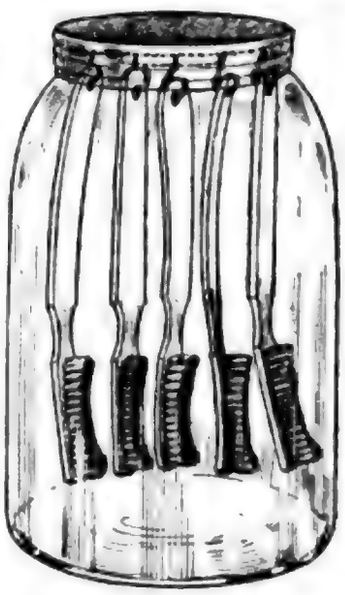
### A Toothbrush Rack and Sterilizer

A convenient toothbrush sterilizer is made from an ordinary fruit jar. A thin piece of soft board is cut circular to fit in the top of the lid. Around the edges of this, as many hooks are placed as there are toothbrushes to be accommodated. In the center of the board a little square of blotting paper should be tacked. Three or four drops of formaldehyde, placed on this blotting paper about once a week, will keep the jar and brushes entirely sterile. The lid of the jar should be kept screwed down when the brushes are not in use. —Dr. G. H. Glitzke, Kansas City, Mo.



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### Rope Used to Clean Gun

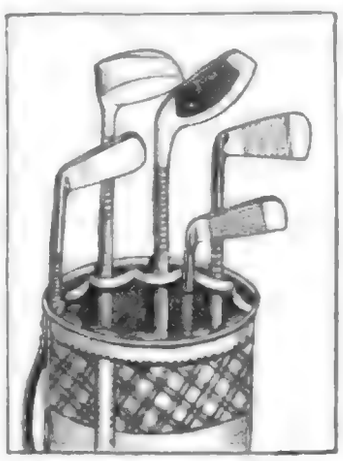
In cleaning a gun barrel, a better job can sometimes be made with a rope than with the cleaning rod. Fasten a screw eye to a post or wooden fence, and attach a rope as thick as the diameter of the bore of the gun. Run the rope through the barrel, and hold the end with one hand, working the barrel back and forth with the other. If the rope is too thin to fill the bore, tie pieces of cloth around it.—Maxwell H. Spreen, Jackson, Mich.

### Signal Lamp for Electric Iron

It is difficult for a housewife to keep in mind whether the current which feeds an electric iron is turned on or not, and, as a result, a good deal of current is likely to be wasted. A small incandescent lamp will cure the trouble, if it is mounted on the same circuit as the iron, with the sockets on the iron and the lamp wired in parallel. By this arrangement, if current is turned on to feed the iron, it will also light the lamp, so that it will be possible to tell at a glance whether the current is flowing. The lamp can be screwed to the wall or ceiling at any convenient place.—J. Horace Van Nice, Waukon, Iowa.

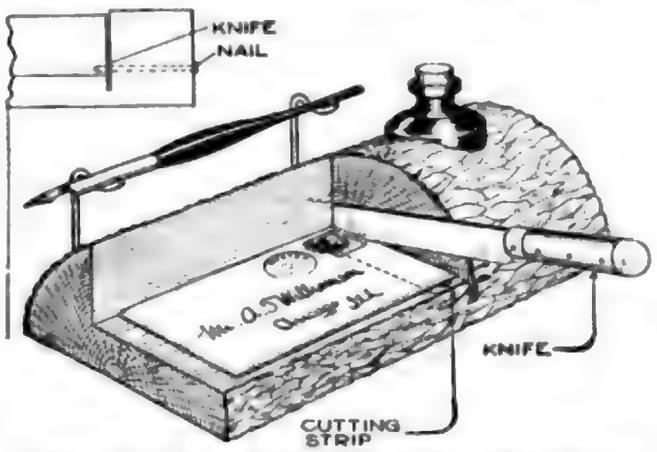
### To Protect Clubs in the Golf Bag

Most golfers know what damage can be done to the shaft of a driver or brassie by being nicked and scarred by the shorter iron clubs in the bag. This will happen in the ordinary golf bag, no matter how carefully it is handled; but it can be prevented by carrying a bag which keeps all the clubs separate. Sew loops of cloth, or leather, inside the mouth of the bag—one for each club, making them small enough to hold the clubs snugly without making it difficult to withdraw them. The long clubs can then be kept on one side of the bag and the short ones on the other, so that the heads of the latter cannot do any damage.—R. H. Cochran, Lamar, Colorado.



### Inkwell and Letter Opener

A combination letter opener and inkwell holder was made from a slab of wood cut from a tree trunk without removing the bark, the purpose being to give the object a rustic appearance. A portion was cut away from one end, to leave space for an ordinary envelope, as shown in the sketch, and a slot was cut with a sharp chisel at the inner end, wide enough to admit the blade of a knife. This knife was then attached to the wood




**A Desk Ornament, Made of Unfinished Wood, Serves as a Pen Support and Inkstand, with an Attachment for Opening Letters**

with a nail, as shown in the detail drawing, so that it was hinged at the end of the blade, and dropped into the slot when cutting off the end of an envelope. The side of the slot was reinforced with a piece of sheet steel, which fitted snugly against the cutter. An old ink bottle was sunk into the top of the slab, and fastened with putty, which was painted the same color as the wood. Two short pieces of wire bent as shown in the illustration, formed brackets to support a pen. The knife was intentionally chosen for the rough finish of its handle, so that it harmonized with the rustic appearance of the rest of the article.

### Using Pine Stick for Lettering

A storekeeper, who wished to make some large signs with heavy letters, whittled one end of a soft-pine stick down to a sharp, broad edge, and used it to letter the cards. A tool made of this kind of wood works equally well with ink or paint, and, in the hands of an amateur, will make a much cleaner letter than a brush. The whittled end resembles the chisel edge on a red-sable lettering brush, so that the ordinary motions are made in using it; but, being more rigid, it demands less skill on the part of the workman.

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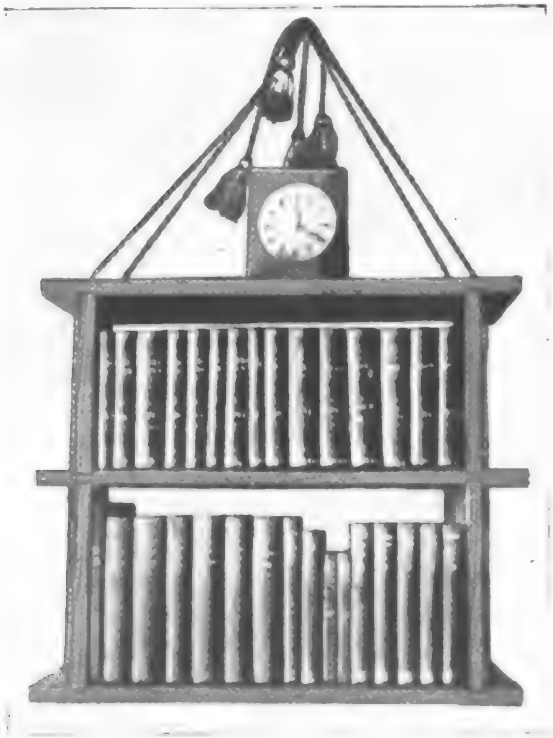
### Neat Hanging Bookshelf

This little bookshelf cost only a few cents, and about an hour's work. It requires three oak boards, 8 by 24 in. and 1 in. thick, four boards, 8 by 10 in. and of the same thickness, and two portière



Portière Ropes are Employed to Support from a Stout Hook in the Wall a Bookshelf Made from a Few Pieces of Plain Lumber

ropes. It is neater to chisel out about ¼ in. on the long boards, at the place where the upright boards will be, as illustrated. These should be placed about 3 in. from the edge, and the whole nailed securely together, but before doing this, bore two ½-in. holes at the end of each plank, close to where the upright boards will go, to admit the cord. Now nail together, stain, and polish. When dry, run the cords through, knot together at the top, and the bookshelf is finished.—C. Remington, Knoxville, Tenn.

### A Two-Colored Hyacinth Bulb

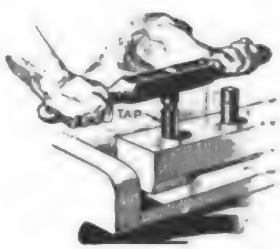
One of the exhibits at a flower show was a hyacinth having bright-blue blooms on one side of the spike and pink on the other. The plant had been grown by combining two hyacinth bulbs of varieties that bloom about the same time, one of them belonging to a blue-flowered species and the other to a pink. A portion of each bulb was cut away at the side, great care being taken not to damage the central shoot, although it was left fully exposed. The larger parts of the bulbs carrying the shoots were then tied together facing each other, and a little moss was tucked into the crack between them to keep out moisture. The double bulb was then planted in the usual manner, and when it started to grow, the flowering stems came up as one, the stalks completely amalgamating. The flowers which grew were blue on one side and pink on the other, the middle blossoms sometimes being party-colored.—S. Leonard Bastin, Bournemouth, Eng.

### Preserving Crease in Soft Hats

A soft hat loses the neatness of its appearance if the depression, or crease, in the crown is not sharply defined. One or two metal clips of the kind used on stationery can be placed inside the hat to hold the material and preserve its shape, without causing any inconvenience to the wearer.

### Turnbuckle Used as a Tap Wrench

A small turnbuckle of suitable size makes a handy wrench for use with taps and reamers. Remove the eyebolts from both ends of the turnbuckle, and file the inside surfaces of it flat to make them fit snugly against the squared end of the reamer or tap. Face off the ends of the bolts, screw them back in, and the tap wrench is ready for use. As thus made, the wrench will, of course, be suitable for only one size of shank, but it can be made useful for various sizes by filing a taper in the turnbuckle from one end of the inside space to the other. In order that the tap or reamer may be placed at or near the ends of the space, to fit at the place where the width is suitable, it will then be necessary to remove the original eyebolts, unless they have extra long threads, and substitute bolts long enough to reach a tap which on account of its size must be held at either end of the turnbuckle.—W. C. Reichard, Syracuse, New York.

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### Electric-Light Globes as Targets for Practice Shooting

Burned-out electric-light globes make good rifle targets, whether fixed stationary or thrown into the air. When struck they give certain proof that a hit has been scored. They also make a good floating target, if painted black and thrown into a pond.

### Acid Repairs for Leaking Radiators

Leaks are sometimes caused by slight cracks in the surface of radiators and other metal containers of liquid. Paint the cracked part with nitric, sulphuric, or some other strong, acid. It will cause corrosion at the "lips" of the crack, and the resulting salts will, in a few minutes, stop the leak, unless it is too large for the method to be effective.

### Lead Ribbon for Holding Cut Flowers

A strip of lead ribbon, about 1½ in. wide, is extremely useful in arranging cut flowers and blossoming twigs. The ribbon, which is cut from the end of a long sheet, can be obtained from any dealer in plumbers' supplies, and is so pliable that it can be rolled up or bent into any shape desired. It is especially useful with the low Chinese bowls sometimes used for holding flowers, as in a bowl of this kind it is necessary to have some sort of support for the stems. Holders for this purpose can be bought in stores, but are not always of the desired shape, whereas a strip of lead ribbon can be bent to make openings of exactly the right size for the flowers or twigs which are to be displayed. They can be bunched together, encircled by one band, or distributed about the bowl and held in position by folds made in the ribbon according to the taste of the home gardener. In this way a wide-mouthed vase can be made to furnish a large variety of effects. The metal itself may be a little unsightly, but it can easily be hidden by pebbles and moss.

### Chute Carries Trimmings from Prints to Wastebasket

A photographer, tired of the accumulation of trimmings from photo prints which littered the space around the trimming board on his worktable, bent a sheet of tin into the shape of a rectangular chute,

Trimmings from Photo Prints Fall Directly from the Trimming Board, through the Chute, into the Waste Can

as shown in the photograph, and fastened it by the trimming board at the end of the table. As the waste pieces fall from the trimmer, they pass through the chute into the receptacle below, thus affording a constantly clean worktable and a considerable saving of time.

### To Vignette a Photograph

A simple way to obtain a vignette effect, without a mask made for the purpose, is as follows: Expose the paper as usual, wet it in clean water, and flatten against a piece of glass, with coated side out. Touch the fingers in the developing solution and gently rub the paper in the center. As the form of the picture looms up, the fingers should follow the outlines of that part which is desired to show up. The fact that the paper is wet will make the edges of the developed field diffuse. When fully developed as desired, wash in water and put in the hypo bath.—Tom Blackburn, Chicago, Ill.

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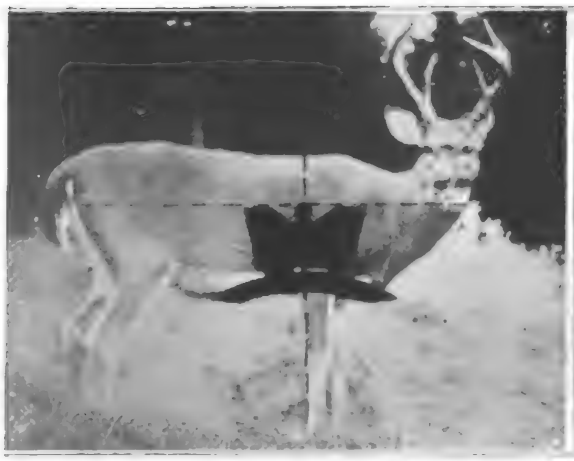

Fig. 1

Fig. 2

**At the Left is Shown the Proper Aiming of Guns Provided with Open Sights. At the Right, the Same Weapon is Incorrectly Aimed, So That a Miss will Probably Result**

# The Mechanics of Sighting and Accurate Aiming

By F. E. BRIMMER

A GREAT many hunters, who are accurate target shots, fail to bring back the "bacon" when they go into the mountains, because of inaccurate aiming. The alibi of "buck fever" is no excuse for misses any more, because the modern rifle allows so many shots that the first faulty shot may be quickly followed by a more accurate one. There are a few principles that will help every hunter if he but bears them in mind in shooting.

In Fig. 1 is an illustration of the manner in which open sights appear when properly alined upon a standing deer. Notice that this shooter was an old hand because he held his rifle plumb. The dash lines show how the rifle was held plumb. Notice that the top edge of the sight forms a practically true horizontal line, while the top of the front sight forms with the notch of the rear sight a practically perpendicular line. Only when a rifle is held in this manner can accuracy be expected.

In Fig. 2, the shooter did not hold his rifle plumb. At first glance one might think that just the same he got his deer, but there are two reasons for a miss, and either one of the two causes illustrated would make inaccurate shooting. In the first place, the shooter rolled his rifle to the right so that the upper edge of the sight does not make a horizontal line, nor does the direction of the front sight extend directly upward. If the bullet went in a straight line from rifle muzzle to the target, then this would not be an incorrect aim; but since the proposition of trajectory does enter, it is quite essential that the rifle be held plumb.

When the Indian shot his bow, he was conscious all the time of the principle of the trajectory, for he could plainly see the course of his arrow, and he knew that he must aim high to hit the mark. His arrow always rose higher than the target, and began to descend before it hit. Just exactly the same thing happens in the case of the bullet, but of course not to such an extent as in the case of the arrow. Remember that the bullet is thrown higher than the line of vision at every shot, and that the sights do not point the path of the bullet, as most shooters erroneously believe. The bullet travels in a curve while the sights are alined as though the bullet sped in a perfectly straight line.

The greater the distance, the higher the curve, with respect to the imaginary straight line from sights to target. A rifle that has a higher velocity will have a flatter trajectory than the low-velocity rifle. This means that with high velocity the actual path of the bullet does not differ so much from a direct line from rifle to target. However, no rifle can have an absolutely flat trajectory. In Fig. 2, the shooter, by rolling his rifle barrel to the right, caused his bullet to speed way to the right of the deer, or if a hit was made by accident, it was only in the forward legs of the deer, and a wounded animal was the result. Probably this is the most common error in shooting at game in the woods.

The second reason why the shot would have failed to hit the deer in a vital place, in Fig. 2, is because too coarse a sight was taken. Notice that the front sight sticks up much farther than in No. 1.



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This caused the bullet to fly high, and is another very common mistake made in the haste to shoot a deer, moose, caribou, or elk. At the rifle range plenty of time is allowed for proper alinement, and there is practically no excitement, while in the woods the stress of haste and excitement make it very difficult for the average shooter to hold his gun plumb, and at the same time take just the right amount of front sight in the notch of the rear sight.

Practice standing before a mirror, with the rifle held as if to make a shot. After the gun has been thrown to the shoulder, quickly see if the butt fits against it in a perpendicular manner. By acquiring the habit of correct holding, one can overcome the wrong manner of turning or rolling the rifle to one side or the other when doing quick shooting. Watch the faults in the mirror until the correct form is attained. When standing upright, it is easy enough to hold a gun plumb, but in the woods one often has to shoot from a cramped position and under other unfavorable conditions. None of these handicaps need cause poor shooting after a reasonable amount of practice in holding the rifle plumb.

In Fig. 3 is illustrated the way peep sights will appear when properly alined to bring down the deer. This is one of the mechanically easiest sights to use, because so much of the front of the barrel shows to the eye that there is not the tendency to roll over the barrel as in the case of open sights. Yet this may be done unconsciously, if a leaning tree happens to stand in line behind the deer. In this case the eye is deceived into believing that the tree is perpendicular, as most three trunks are, and so the shooter allows the barrel to roll to one side or the other just a very little. This causes a clean miss or a wounded deer, for the same reason given in the case of the open sights.

Another type of sight that is used for long shots at standing game is the telescope sight, illustrated in Fig. 4. In this case two cross-hairs, placed at right angles, determine the aim of the bullet. In the illustration the sighting is correct. Since this type of sight is used for long distances, it is more important to see that the rifle is not allowed to roll over on either side, because the error will magnify as the distance increases.

A careful study of the mechanics of sighting illustrated by these four photographs will be of great help to the field shot. Unless the rifle is held mechanically correct, there is no ammunition made that will get game. The same principles will hold true for the shotgun, in the field or at the traps.

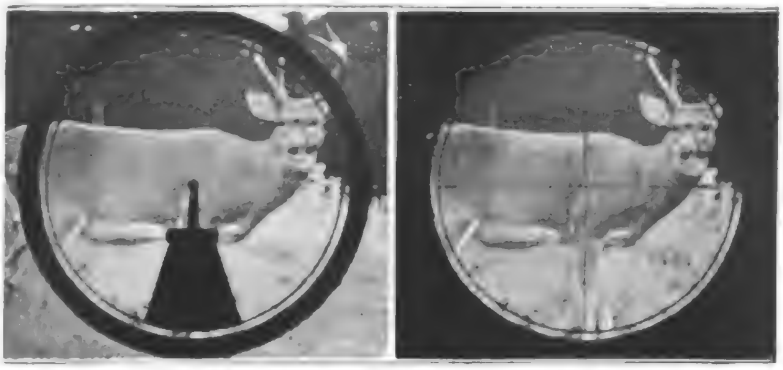
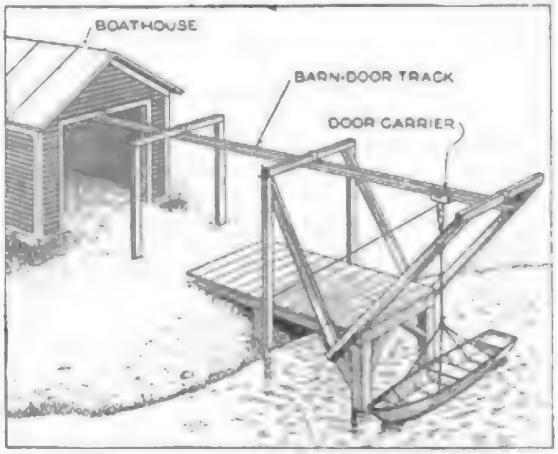


Fig. 3 Fig. 4

**To the Left is Shown the Correct Aiming of Peep Sights; to the Right, Correct Alinement of Telescope Sights**

## Trolley Carries Boat into House

A group of boating enthusiasts simplified the work of launching their boat by using an overhead track composed of several sections of the I-beam rail used to support a sliding barn door. The boat hung from a tackle block attached to an ordinary barn-door carrier, and was slung by means of large screw eyes, placed 3 ft. apart along the gunwale.




**Suspended from an I-Beam Track, a Pleasure Boat is Carried from the Boathouse to the End of a Pier and Lowered into the Water, or Lifted from It and Carried Back into the House Again**

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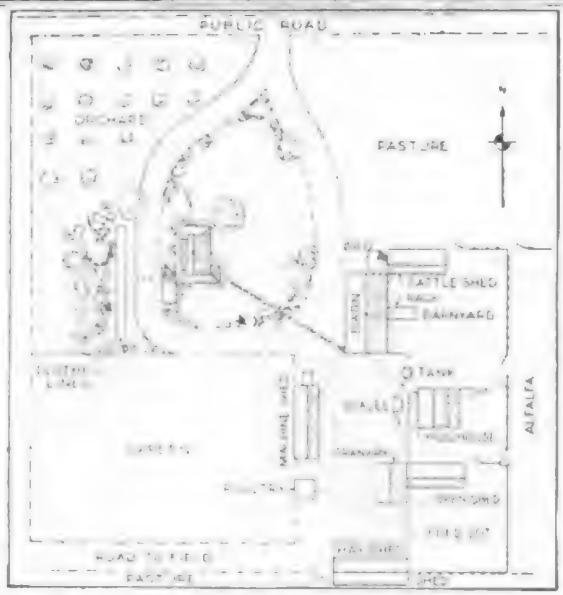
# FARMSTEAD LAID OUT ON ENGINEERING PLAN




**The Model Farmstead at Nebraska University: The Plan Drawing may be Used for Laying Out a Full-Sized Farm. The Dotted Lines Indicate the Routine Course of the Farmer**

MODERN manufacturing plants are so arranged that the sequence of operations is continuous, from raw material to finished product. It is by no means impracticable to apply the same broad principle in laying out a farmstead, with due allowance for the peculiarities of each location. A model farmstead, one-fourth size, constructed and laid out by agricultural students at Nebraska University, presents the ideal elements of such an arrangement in concrete form. It represents the buildings of a 160-acre farm. The house is located on high, well-drained land, near the highway, and with a thought for the pleasantest view. Its back door, opening toward the buildings, leads into the wash room, which must be traversed on the way to the dining room. All the buildings, so placed that prevailing winds carry odors away from the house, act as windbreaks for the yards, which adjoin the pastures. Most of the fences serve two lots. Sufficient feed for the stock in each lot is stored in an adjoining building, saving much walking, and most of the buildings are accessible by team without opening gates. With this arrangement, the farmer's morning course is first to the barn, to attend to the animals there and separate the milk; then to the hog house with skim milk; next to the combined crib and granary; to the hay shed to feed the cattle; to the poultry house; back to the barn for the cream, and home. Coming in from the field, the route to the barn leads past practically all the buildings, and chores can be done while the team is drinking at the trough and going into the barn. As between this, or a similar arrangement, and one laid out without planning, it is estimated that as much as a mile of walking a day would not be an extraordinary saving. Further points for study are the use, other things being equal, of unproductive land for building sites; provision, if possible, for running water in the house, and buildings opening to the south, for winter warmth, but with a north opening also, to create cool air currents in summer.

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# Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 OCTOBER, 1919 No. 4

## Deep-Sea Fishing Simplified by Seaplane

SPORTSMEN of both coasts now have tried the seaplane as a fishing boat, and found it good. The two New York fishermen who made the first trip the other day started late, but they were first on the grounds. They passed the plodding motorboats—considered, until now, remarkably swift—midway, and were among the schools of bluefish before their astonished brother anglers came within hailing distance.

However, the speed alone was not the thing that established the plane as a fishing craft par excellence, but its ability actually to locate the fish schools for the impatient anglers, by giving them the vision of great altitude. With such guidance, using their rods from hull and wings, they made a remarkable catch in a very short time.

A party of Los Angeles fishermen found the seaplane most valuable for the

Fishing from the Hull of the Seaplane, the Angler may Forget His Wings, and Think of His Craft Merely as a First-Class Fishing Boat

If the Fisherman Desires to Change His Position or Find a Breezier Seat, the Wings of the Resting Plane Are Always Available

The Los Angeles Party Was Quite Large, but did Not Tax the Capacity of the 16-Passenger Plane, Which Made 90 to 100 Miles an Hour

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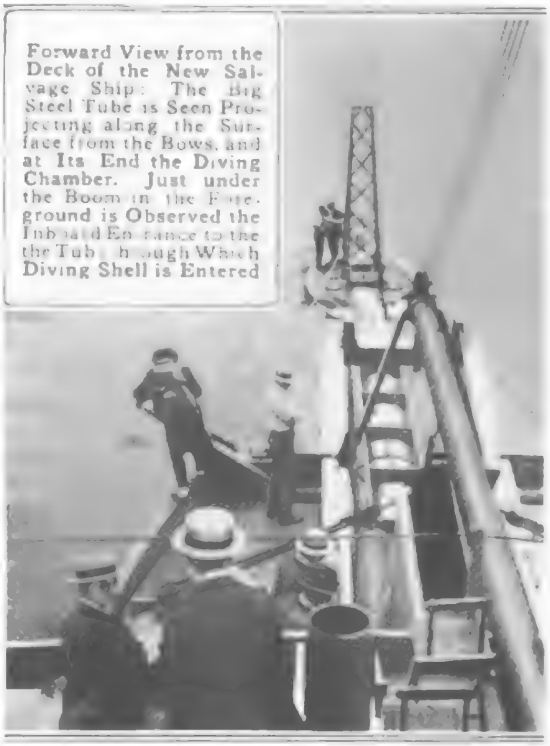
**It Is Apparent That the Seaplane Fishing Party "Brought Home the Bacon," and Equally Plain, from One or Two of the Costumes, That Angling Was Not the Only Aquatic Sport Indulged in the Calm Waters of the Kelp Beds, After a 50-Mile Flight in a Half Hour**

mileage it so rapidly consumed; for distances are long on the Pacific. To the kelp beds of Santa Barbara is 50 miles. They made it easily and quickly, passing smoothly above unpleasantly rough seas and landing on the calm waters of the weed bars, from whose well-stocked but unfrequented pockets they took as many fish as they cared to burden the plane with on the homeward trip.

A wonderful vista of brand-new sport opens with this application of the seaplane, because inaccessible places are quickly reached.

# SALVAGING SUBMARINE EXPLORES OCEAN BED

The queerest submarine boat of all has just made its appearance in the waters of Long Island Sound. Its purpose is peaceful, but none the less extraordinary; for it is to be used to explore the bottom of the sea, and to salvage what it may of the 22,000,000 tons of material that went down in the war. Its most remarkable feature is that its occupants may open a door in its bottom and walk, almost dry-shod, on the ocean floor. The inventor of the strange craft is Simon Lake, celebrated builder of American submarines. The new boat, however, is only sub in part, for the greater portion of it, looking like a big twin-hull dredge ship, stays afloat and provides for the safety and comfort of those incased in the diving shell on the ocean bed.



**Forward View from the Deck of the New Salvage Ship: The Big Steel Tube is Seen Projecting along the Surface from the Bows, and at Its End the Diving Chamber. Just under the Boom in the Foreground is Observed the Inboard Entrance to the the Tube through Which Diving Shell is Entered**

The peculiar mechanism of the vessel comprises a long steel tube extending forward from between the bows, at the end of which is a steel chamber. When the exploring crew has entered the chamber by way of the tube, whose diameter is 4½ ft., the latter is simply turned downward on its inboard pivots until the chamber rests upon the bottom. Air under pressure is constantly pumped in to exclude the water. On the bed of the sea, the bottom door may be opened, giving direct access to the ocean floor and whatever may rest upon it.

The first model has a diving chamber 8 ft. long by 7 ft. high, and has operated in water up to 54 ft. deep. But plans are under way for a larger ship with a 300-ft. tube; and its first assignment will be the an-

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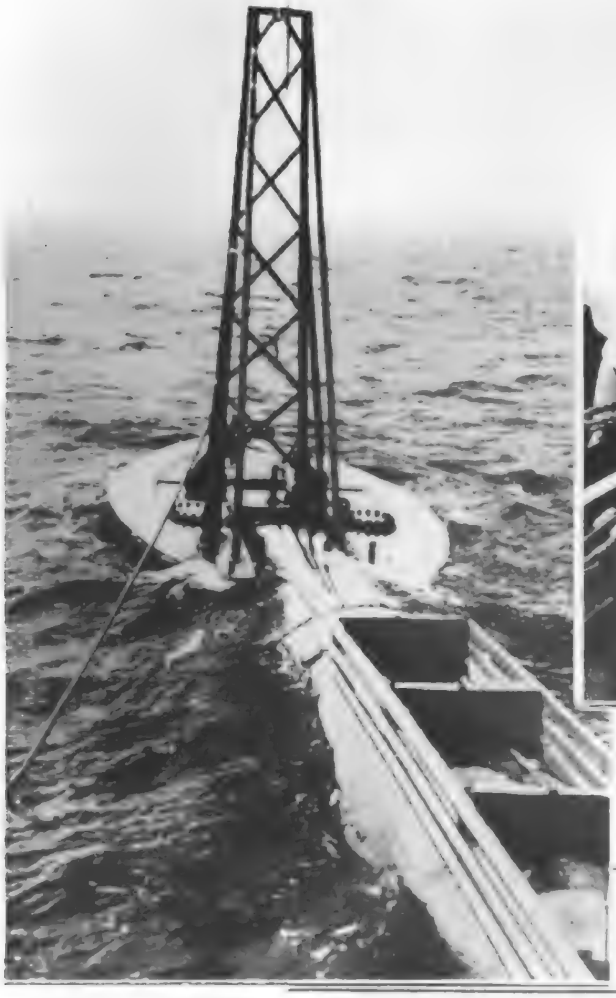

Steel Trap Which Constitutes the Inboard Entrance to the Tube and Diving Chamber: Emerging from It Are Captain Lake (on the Right) and a Guest of the Trial Trip, the Latter with a Horseshoe Crab Picked from the Sea Bottom

Close-Up View of the Diving Chamber, Floating Flush with the Surface Ahead of the Ship, and the Steel Tube through Which It is Entered and by Which It is Submerged

Looking Toward the Bows, the Twin-Hull Construction of the Salvage Ship is Seen; the Diving-Bell Tube Projects from Between the Bows, and is Submerged by Machinery on Board

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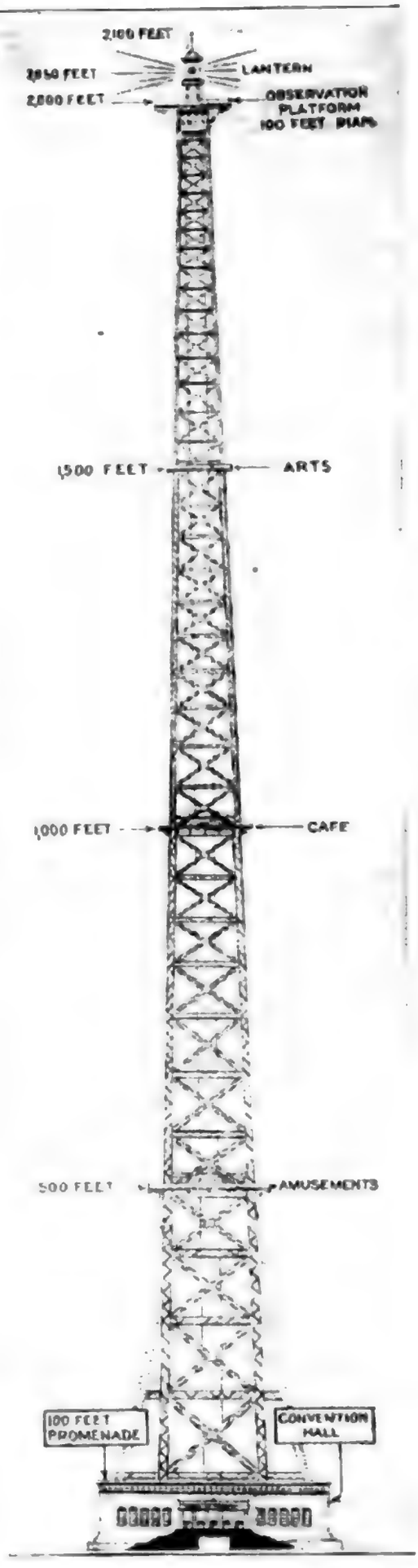
cient wreck of the "Hussar," which, with a cargo of $5,000,000 in gold, has lain at the bottom of Hell Gate since the Revolutionary War.

## PLAN WORLD'S HIGHEST TOWER FOR MEMORIAL

A monumental tower of steel, more than twice as high as the world's loftiest present structure, the Eiffel tower, is proposed by leading citizens of Pittsburgh for a memorial to the soldiers of that district. The total height of the tower as planned is 2,100 ft., with an observation platform 100 ft. in diameter at the 2,000-ft. level, surmounted by four powerful lanterns, indicating, by their colors, the points of the compass to all aerial navigators within a 40-mile radius. At the 1,500-ft., 1,000-ft., and 500-ft. levels respectively are a trophy hall, a restaurant, and an amusement hall. At the base a monolithic structure, 100 ft. high and 300 ft. square, contains free assembly rooms on the ground floor, and a vast convention hall 35 ft. above, seating 15,000. The concrete foundation goes down 60 ft. to bedrock, and in it are imbedded the base columns of the tower. The structure, estimated to cost $3,000,000 and to require 9,000 to 10,000 tons of steel, is designed to use only the standard shapes regularly produced in the "Steel City."

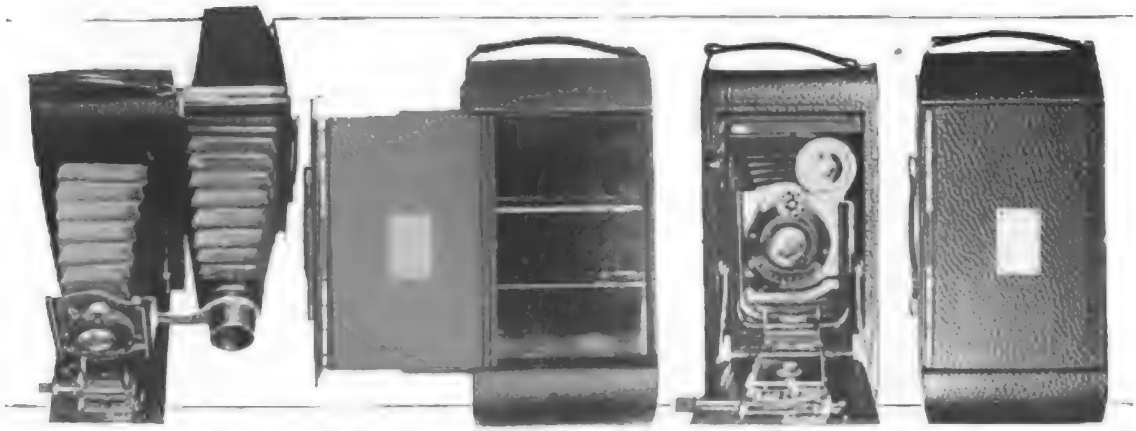



**Pittsburgh's Proposed Memorial, the Tallest Tower in the World, Is a 2,100-Foot Structure of Standard Steel Shapes and will Cost About $3,000,000**

## AUTOS OF FUTURE VERY LIGHT, ENGINEERS SAY

Lighter cars, higher mileage, and fewer cylinders are the predictions of auto engineers, both in this country and in England, for the motor vehicles of the future. A particularly interesting American prophecy specifies a five-passenger car weighing only 900 lb., with a plywood body, a new type of spring suspension, a 120-lb., 15-hp., six-cylinder motor, and a mileage of 30 to 40 per gallon. The design of such a car will be influenced largely by the discoveries and adopted practices in airplane construction, and the result will be an easier-riding vehicle than the present cars, in spite of its extreme lightness. Large cars will be limited to six cylinders, while four will be considered enough for a roadster, and closed bodies will take preferred position. An apparently inevitable development is the design of future motors for the consumption of low-grade fuels. Considerable progress already has been made in this direction, and cars have gradually been growing lighter and more speedy for the last four or five years.

¶An airplane is to be used by a rice grower near Sacramento, Calif., to drive wild ducks out of his fields. Other farmers in that locality may adopt this method of protecting their crops from the birds.



From the Left, the First Picture Shows the Camera with Focusing Attachment Ready for Use; the Second Is a Rear View, Indicating the Way in Which the Back of the Case is Drawn Out; the Third, Front View, Shows the Auxiliary Lens Folded in the Upper Right Corner; the Fourth, Camera Folded

## FOCUS WITH FULL-SIZE IMAGE IN NEW HAND CAMERA

Lack of any means for visual focusing is probably the greatest fault of the popular folding snapshot camera. A camera arranged to supply the deficiency is now on the market, however, and gives a full-size image on ground glass while the exposure is being made. The focusing equipment consists of an auxiliary bellows which is inclosed, with the ground glass, in a sliding box attached to the camera; and an extra lens which folds in alongside the front board. For use, the box is drawn out sidewise, bringing the bellows with it. The latter is then extended and joined to the lens. The two lenses focus together, so that a sharp picture is assured, covering exactly the field the operator desires.

## INTERNATIONAL FUND DESIRED TO RESTORE RHEIMS CATHEDRAL

The nations allied against Germany during the war, who watched with horror the slow destruction of the Rheims cathedral, will be gratified to learn of an opportunity, now presented, for participation in its restoration as a memorial to the heroic dead. Subscriptions will be received by influential committees now forming in all the allied and neutral countries. Supporters of the scheme have found that destruction has gone so far that at least $5,000,000 will be needed for the work; yet they are enheartened by the fact that the original plans have been preserved and may be copied exactly. Much of the fallen stonework, too, can be recut and used again. The project has the approval of the French government.

## PAGING BY DOTS AND DASHES IS NEW OFFICE SYSTEM

A common telegraph key, fixed near the telephone that handles incoming calls, has proven highly effective as a means of paging individual workers in a big government office on the west coast. When a particular person is wanted on the telephone, or called for by a visitor, and his immediate location is unknown, the operator sends out a dot-and-dash code call which is made audible throughout the building by properly distributed sounders. Each sounder has its own key,

Some Member of the Office Force, Whereabouts Unknown, is Wanted at the Telephone, and the Operator is Sounding His Dot-and-Dash Code Call on the Telegraph Key at Her Right Hand

and the call is acknowledged by its recipient before he goes to the main office. No knowledge of telegraphy is required, of course, as each worker uses only his own code.

¶Improvements planned for the port of New York will cost over $28,000,000. Several new piers are projected, and extensive dredging is contemplated.

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# HUNTING WILD HORSES IN UTAH

By FREDERICK KINNEY

AMERICANS who like adventure and excitement in a hunt are advised to try their hand at hunting wild horses. That they will find this sport quite as thrilling as cornering a tiger, is the opinion of a sportsman who has just returned from a month's hunt in Skull Valley, near the Utah-Nevada line.

There are thousands of wild horses in this valley, and ranch owners in that district have begun a war of extermination. The wild steeds are becoming very troublesome, leading away domesticated stock, and demolishing fences and damaging property in general. Before the plan of shooting these horses was adopted, the ranchers tried corralling and shipping them to eastern markets. The expense of catching and shipping the animals was far above possible profits, however, and the danger connected with attempts at capture also were disproportionate. The horses are decidedly vicious, and several cases are cited where they literally dashed their brains out against a tree, or post, rather than submit to capture.

The expedition here referred to included several members, and during the month of wild-horse stalking the party shot 102 animals. The largest day's shooting was ten head. This number was made possible only by the fact that the leaders of two bands of wild horses met at a water hole and immediately began a battle for supremacy.

A fight of this kind is always to the death, and the most exciting period of the hunt was spent in watching the two wild beasts biting, tearing, and kicking, while members of the two bands intermingled and looked on, taking care to keep away from the flying hoofs. It was while the mares were closely banded in this manner that the party shot their record "catch" of ten horses. The noise of the guns soon startled the scores of animals, and they bolted in all directions for the foothills. One of the leaders was left behind, with a broken leg. He was dispatched by one of the hunters. The animals shot by the party were skinned, the hides bringing from seven to eight dollars each in the Salt Lake market.

Ranchers in Skull Valley invite shooting parties to go after the wild horses, and furnish guides and other necessary supplies. Estimates of the number of wild horses in the valley run as high as fifteen thousand.

## PUMP FERTILIZING MATERIAL FROM MICHIGAN LAKES

Valuable fertilizing material can be obtained from the bottom of many of the numerous small lakes in Michigan in the form of marl, a clay containing a high percentage of lime, according to agricultural authorities. Experiments conducted recently, to determine an inexpensive method for removing the deposits, indicated that the substance can be raised economically by a pump of the type used for lifting sand. Where the deposits are loose, the suction of the pump is strong enough to separate it from the bottoms. Dynamite has been found suitable for breaking up more solid deposits. The value of marl as a fertilizer has been known for a considerable time, but the Michigan supply was discovered recently.

## AERIAL TRANSPORT FOR THE DEAD AND THE DYING

Among suggestions lately considered by a great English airplane firm are two which have the merit of extraordinary novelty. The first comes from an undertaker who believes that an airplane hearse should be used when a person dies far from his home or desired place of burial. He believes that such a journey to the grave need not be a bit of sensation mongering, but might actually come to be valued as a striking symbol of man's final destiny. The second suggestion, strange as it may sound to the uncomprehending occidental mind, may yet yield a fortune to some enterprising company. For devout Hindus from all corners of India travel by the hundreds of thousands each year to the sacred Ganges, there to wash away their sins or die in peace on the river banks. Though many are rich, as seen in the holy city of Benares where their lavish charity supports whole tribes of mendicants, many die short of their goal. So the suggestion is made that an aerial service be instituted to rush the sick, and particularly the dying, to the holy stream, that they may die assured of salvation and future bliss.

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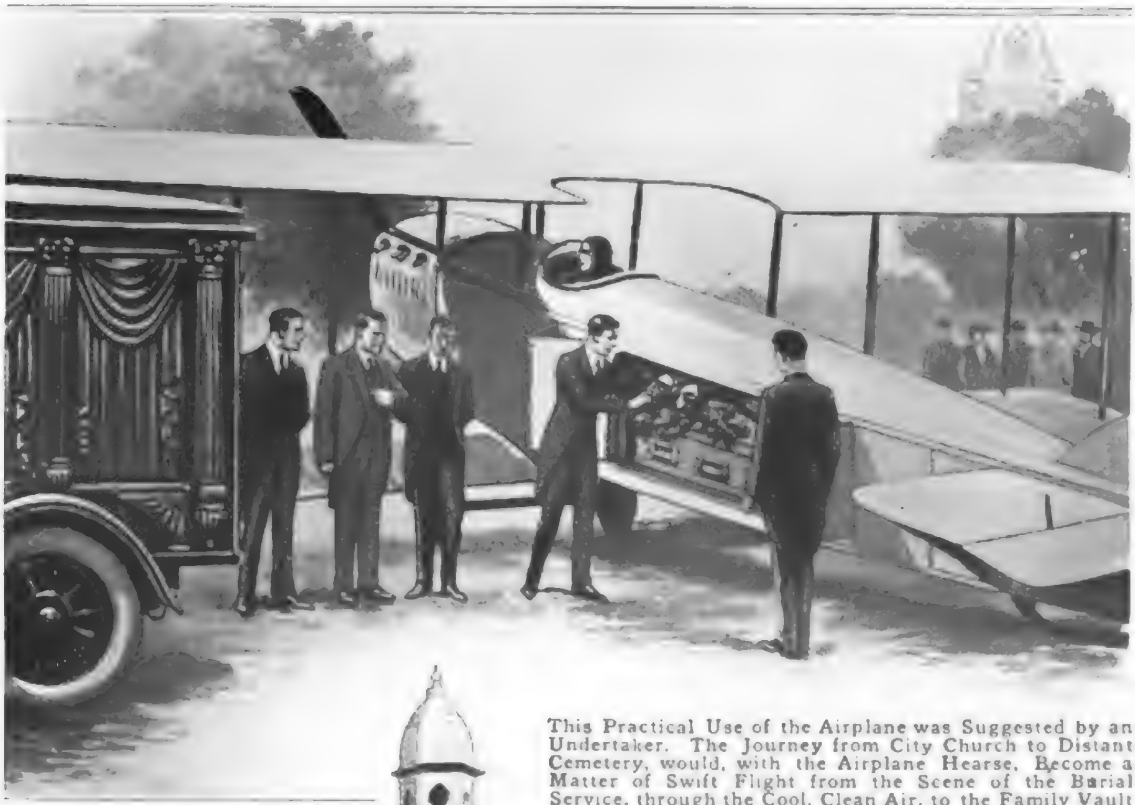

This Practical Use of the Airplane was Suggested by an Undertaker. The Journey from City Church to Distant Cemetery, would, with the Airplane Hearse, Become a Matter of Swift Flight from the Scene of the Burial Service, through the Cool, Clean Air, to the Family Vault

In Accordance with the Proposal Made to an English Airplane Firm the Artist has Depicted the Arrival of a Stricken Hindu at a Burning Ghat on the Shore of the River Ganges. Dying, Far from the Saving Waters of the Sacred River, the Aged Believer has at Last Conquered Innate Prejudice, and to Reach His Goal has Availed Himself of the Airplane, Swift as the Lightning, Wondrous Product of an Alien Civilization



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## STATION SIGN FOR FLIERS ON ROOF OF STUDIO

Anticipating the day when aerial traffic will require station signs, the citizens of Santa Barbara, Calif., have labeled the

**Aerial-Station Sign at Santa Barbara, California: This Picture was Taken from a High Platform Built Especially for the Purpose**

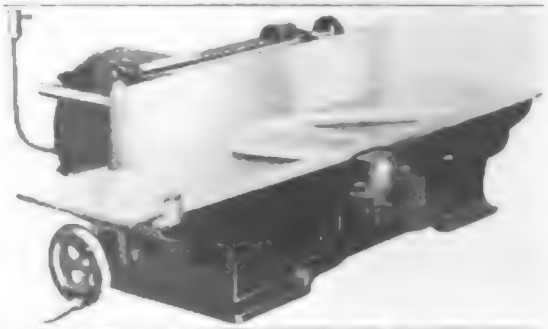
city appropriately. On the flat roof of a long building, used as a studio by a motion-picture film company, is painted the name of the municipality in letters 18 ft. high and 12 ft. wide. White paint was used for the letters, while the background is black. Airmen two and one-half miles in the air have been able to read the sign, it is declared.

## EXPERTS TRAINED BY ARMY AID TRACTOR INDUSTRY

Tractor development has been somewhat hampered in the past by the lack of competent drivers and mechanics, but a new era for the industry has begun with the release from military service of thousands of thoroughly trained experts in these fields. A large percentage of the men who obtained their knowledge in army schools are expected to take some part in the tractor business, either as salesmen, dealers, service men, or farm-work contractors. Many branches of the army taught soldiers how to drive and repair tractors. Besides the motor-transport corps schools that were established not long before the armistice was signed, there were classes in driving and repair work for men in the field artillery, the tank corps, and the quartermaster corps, from the time mobilization began. One of the largest schools was at Camp Jackson, S. C., where field-artillery men were instructed.

## PORTABLE PLANING MACHINE ELECTRICALLY OPERATED

Current from an ordinary electric-lighting circuit will operate a portable jointer, or planing machine, intended for bench use, which has made its appearance on the market. Boards, 6 in. wide, can be handled by the device, though it is so light that one man can carry it easily. The motor is an integral part of the machine, and turns the cutting heads on an extension of its shaft. Interchangeable cutters are used. It is possible to adjust the two-part table of the jointer to vary the distance of its surface from the cut-



**Portable Planing Machine for Bench Use: It Runs on an Ordinary Electric-Lighting Circuit, and can be Adjusted to Meet Many Requirements**

ter, or to regulate the size of the throat over the cutting tool. The fence, which can be set for beveling the edges of boards or for material of different width, is fastened to the motor casing by sliding rods.

**A Few of the Thousands of Men Trained by the Army to Drive and Repair Tractors, with Their Machines: The Picture was Taken at Camp Jackson, South Carolina, Where Field-Artillery Men were Given Instruction**

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Map-Reading Instruction Facilitated by Moving Pictures of Model Mountain: The Camera is Seen at the Left Halfway up Its 90-Degree Arc; at the Right It Is at the Top, with the Miniature "Mountain" on the Floor Beneath, Its Contour Lines Marked with White Worsted. The Insert Shows the Plan of the Model Mountain

## TOPOGRAPHICAL-MAP STUDY WITH MOTION PICTURES

The U. S. general staff, in 1918, decided to utilize the screen as a means of intensive instruction. Maps had to be used and understood in order to break the Boche. Contour lines, which meant little to the average soldier, were explained graphically in a reel devoted to map reading.

A miniature mountain made of modeling clay and soil, with a steep slope on one side and a gentle declivity on the other, was constructed on the floor of a daylight studio. On a curved wooden track covering a 90° arc, the camera, always 6 ft. from the mountain, faced it and a grayish background.

The observer first sees the mound against the "sky" from the horizontal. A line, produced by white worsted, gradually appears at the base. A card marked "sea level" flashes in on the line. At frequent intervals similar lines appear at proportionate 20-ft. heights. Cards announce 40 ft., 60 ft., etc. When the summit is reached, at 100 ft. in this case, the student has a realistic idea of elevations and slopes.

A map is formed on the screen by a gradual elevating of the camera through the 90° arc. One or two exposures are made at every minute progression. The perspective changes as if viewed from a rising balloon.

A series of elliptical white lines are seen from the perpendicular. The student notices that they are close together on the steep side and more separated on the gentle slope. He is then better able to interpret topographical maps and to help win battles.

## BIG BRITISH AIRPLANE MOTOR IS THOUSAND HORSEPOWER

An airplane engine declared to be the largest yet produced, developing 1,000 hp. nominally and yielding 900 at regular working speed, has been completed at an English factory. Its 12 cylinders are arranged on the V-type, or "twin-six" plan, and its weight figures out at less than two pounds per horsepower. Though special planes are to be constructed for the giant motor, it will probably be tried out in some of the huge air craft recently built in England.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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# CANAL WITHIN LIMITS OF NEW ORLEANS TO SERVE AS INNER HARBOR

The Long-Standing Commercial Handicap Imposed on New Orleans by the Variable Level of the Mississippi River will Cease to Exist with the Opening of This Modern, Fixed-Level Ship Canal, Where Ocean Shipping will Find Commodious Harbor Facilities

WELL within the city limits of New Orleans, the state of Louisiana is constructing a deep industrial canal, which will serve as an inner harbor and give the entire port a greatly needed, fixed water terminal. It is a project unusual in construction and remarkable in engineering design, and will give the city an inland waterway rivaling in depth the Panama, Suez, and Kiel canals, and taking its place as one of the six greatest canals in the world.

The "Inner Harbor Navigation Canal of the Greater Port of New Orleans," as the new enterprise is officially called, will connect the Mississippi River with Lake Pontchartrain by means of a channel, six miles long, 30 ft. deep, and 330 ft. wide at the water level, with a bottom width of 150 ft. When completed, the canal will have industrial basins and ocean docks all along its length, providing suitable accommodations for ocean steamers and giving private industries their own wharves and docks, which has never before been possible. By means of this new waterway, the route from the Crescent City to the Gulf of Mexico will be cut approximately in half, as compared with the former outlet by way of the Mississippi. The lake now has a 14-ft. channel to the gulf, sufficient only for light-draft vessels and for coal-carrying barges, but this channel will also be cut to 30 ft., making it possible for larger steamers to reach the sea.

The inner-harbor improvement is expected greatly to augment the commercial importance of New Orleans, whose export and import business is already considerable. It solves for the city a problem that has always handicapped its growth as a port. By the state laws of Louisiana, which go back to the days of the Louisiana Purchase, the banks of the Mississippi are public property. No private owner may enjoy complete domination over the river front before his plant,



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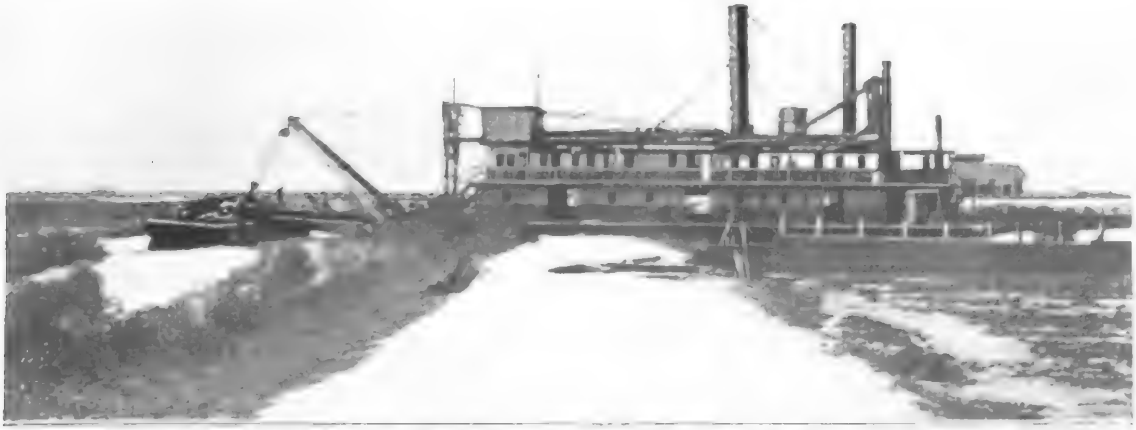

**Construction of the Ship Canal has been Pushed with an Energy Which Is Unusual in Civic Undertakings. This Dredge has Just Eaten through the Macadamized Roadway, Encountered in Digging the Upper Portion of the Canal as Pictured on the Opposite Page**

except by consent of the Levee Board and the governing authority over public wharves. Naturally, this has restricted private construction, and there are no private docks to speak of. Furthermore, the Mississippi River itself does not permit satisfactory or secure wharfage facilities. Not only has it a swift down current, but it is so affected by weather and seasonal conditions, that the high and low-water marks vary as much as 21 ft., while the normal rise and fall varies about 18 ft. Also, since the elevation of the city is below that of the river and all river property is leveed, the whole city is subjected to possible overflow and loss. Hence, all buildings along the river must be built to withstand the current and floods, which, in the soft alluvial soil of the district, is not a simple matter. Such plants as have been built are placed some distance from the water, which is another handicap in itself, particularly as some enterprises must have fixed-level navigable water with a private frontage.

All these idiosyncrasies of the Mississippi, however, with the problems and perplexities they have heaped upon the overburdened engineers, have now been completely nullified by the peculiar and ingenious

**One of the Hydraulic Dredges has Here Encountered Some of the Most Difficult "Going" to be Found on the Six-Mile Job. The City will Countenance No Delay, However, as the Completed Canal is Expected to Prove a Tremendous Commercial Asset. It will Not Only Give New Orleans the Harbor Area Which She Now Lacks, but will Shorten the Ocean Voyage to New York by 160 Miles**



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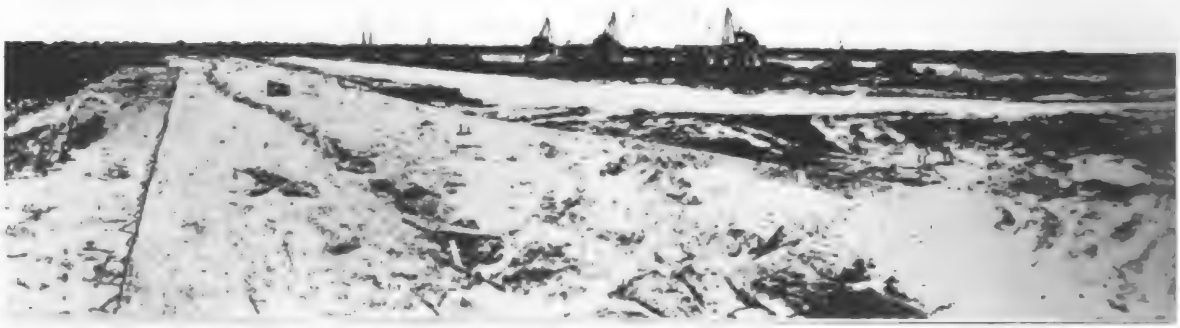

From the Mississippi River the Canal Cuts through the City of New Orleans to Lake Pontchartrain, Seen on t
of the Ground Which has Made Lock and Bridge Construction So Perplexing. The Soil Is of Poor Bear
was Designed as a Floating, Integral Structure Resembling a Huge Concrete Bathtub with Hinged Ends. It
Pontchartrain. The Level of the Canal will Be the Level of the La

construction of the canal, which for the most part will have a fixed water level, taking water from Lake Pontchartrain and varying only as the lake itself does, which is a negligible amount. This is accomplished by a most remarkable lock, so built as to withstand the differing pressures of the water from the river on one side and from the lake on the other, while at the same time it protects the city from being flooded by the canal water.

The line of the new inner harbor and canal is approximately five and seven-eighths miles long, running east and west in the form of two tangents. A vessel passing from the river to Lake Pontchartrain enters the canal on a short turn, which makes access to or from the down current easy. The incoming ship soon encounters the lock, about a mile from the river entrance, which holds back the river and keeps the water in the canal at the level of that in the lake. As, for practical use, no canal is wider than its lock, the dimensions of that at New Orleans are important. It will accommodate ships of more than 60-ft. beam, about 600 ft. long, most 10,000-ton vessels being able to pass. Two ocean-going steamers can pass side by side in the canal.

After passing through the lock, the ship enters the inner harbor, on either side of which are to be public wharves. A large, rectangular turning basin, 1,000 ft. long and 875 ft. wide, will extend from the canal line, giving special facilities to the shipbuilding plant located at this point, near an important bridge carrying city traffic and adjacent to the second tangent of the canal. From there on, the

Near the Entrance to the Mississippi River, the Government is Building Great Warehouses for the Storage
have been Purchased by Shipbuilding Companies. The Canal Offers the Varied Industries of New Orleans The

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t. The Panoramic View Shows the Northern End of the Canal, and Suggests the Unstable Character e. While Rock Bottom is Not Found Less than 1,800 Feet from the Surface. For Just This Reason the Lock Lock Which will Compensate for the Varying Differences in Level between the Mississippi and Lake h is, of Course, Unaffected by the Caprices of the River

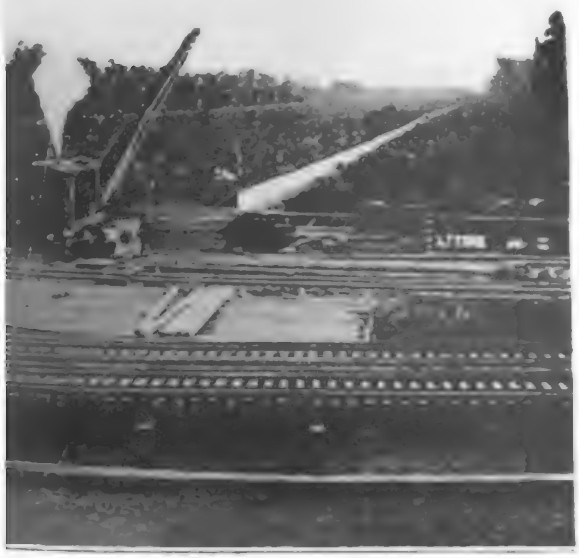
canal runs straight to the lake, the shores being equipped with steamer slips, arranged in an unusual way.

These slips extend for 1,000 ft. on either side of the canal and are 225 ft. wide, 650 ft. long, and 225 ft. apart. Here eventually will be erected permanent terminals, docks, and piers of private enterprises. The arrangement of the slips is such that there is no need of turning basins. A vessel, to leave such a slip, simply backs out into the main channel and over to the opposite side of the canal, and turns, having enough leeway to go out by the bow.

The lock itself is a remarkable device, 75 by 1,000 ft. in size, and solves a problem that has puzzled engineers for some time. The chief difficulty has been to keep the canal water at an even height, and to hold back the Mississippi water. Moreover, the soil all through the district is of such a loose nature and rock bottom so far under the surface, that some way had to be determined to make the lock secure and free from the possibility of a breakdown. So the lock was built as a "floating structure." The base is simply a thick concrete slab resting on a foundation of piles, driven within a cofferdam extending beyond the area of the base of the lock. Reinforced-concrete walls act as slabs which transmit the pressure of the water to the base, through diagonal struts at the top.

The most unusual feature of the lock is, perhaps, the arrangement of the gates, which miter in either direction. In this way, the reverse pressure of the water, due to the variations in the level of the lake and the river, is kept under control. The lock is also equipped with safety devices that prevent the flooding of the city from the canal, if there should be a break or failure in the lock gates. At the head of the lock is located a drawbridge, carrying city traffic, which will be interlocked with the gates, so as to form a dependable protection against collision with ships. A revolving bridge, to be mounted on the lock wall, will permit the ready placing of caissons across the lock in case of accident, or some other emergency, during the high-water period of the river.

In the more congested parts of the city, there are four bridges over the new waterway, which carry across it railroad tracks, electric-car lines, and city streets and sidewalks. Some of the greatest difficulties in digging the channel, now practically completed, were encountered in clearing out the land east of the last bridge selected for the canal route. Miles of forest-covered land had to be cleared. The sides of the channel were



olies. Other Available Portions of the Canal Frontage Opportunity to Possess Normal Docking Facilities

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A "Fleet" of These Dredges was Used in Pushing the Six-Mile Cut from Lake Pontchartrain to the River. The Completed Cut Measures in Cross Section 330 Feet at the Top, 150 Feet at the Bottom, with a Depth Throughout of 30 Feet

fenced off and filled in. Half a dozen, or more, dredges equipped with cutters practically ate their way from the lake, to connect with the excavation work being carried on in the opposite direction. At one point, a dredge practically "ate up" a well-established road.

The improvement, which is being built by the State Board of Port Commissioners, will cost in the neighborhood of $12,000,000. It is calculated that the main channel alone will give at least 50,000 ft. of water frontage, where industries can be established, and by a system of lateral canals this may be increased to 25 miles of wharfage space. An eight-mile waterway is also planned to connect with Lake Borgne.

The Soft Soil Made Heavy Piling a Necessity for Each of the Four Bascule Bridges, All of Which will Carry Heavy Traffic

The new canal system will be coördinated with the railroads, by means of the Belt Line Railroad of New Orleans, one of the few municipally operated roads in the country. This will serve all the piers and terminals along the route, and connect them with the trunk-line railroads entering the city. The inner harbor will, therefore, be readily accessible to the transportation facilities of the port and give private enterprises the secure wharfage and the rail and water connection so essential to them.

The restrictions brought about by the war did not interfere with the work on the canal. In fact, because of the shipbuilding and other war industries which would be aided by this route, the government expedited the construction and built three great depot warehouses, six stories high, at the river entrance, giving it facilities for storing 178,500 tons of miscellaneous goods and a wharf and storehouses nearly half a mile long. This was a development of the commodity-warehouse idea, planned by the dock board, to enable coffee, hides, and all other incoming and outgoing cargo to be stored in a place where it would be accessible to either importer or exporter.

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While the dredging of the channel has been completed, there is still much to be done, and the inner harbor will not be ready for complete use, with the lock, until sometime next year. Vessels will be able to pass into and out of the canal via the lake this year, but not to complete the journey to the Mississippi River until 1920.

There has been some talk of the possibilities of the government declaring New Orleans a free port, but that awaits action by congress. In case it is favorable New Orleans will naturally become one of the import centers of the country, and the industrial canal will become a free zone; but in any event, the authorities expect that the canal will have the effect of making New Orleans the port of deposit and the industrial port of the South, thereby greatly adding to its commerce.

## GREAT DRY DOCK CONSTRUCTED IN HAWAIIAN ISLANDS

Large enough to accommodate the biggest naval vessels afloat, or likely to be built for some time to come, the enormous dry dock, which has been under construction for several years, was completed recently at Pearl Harbor, Hawaii, the latter the most extensive island in the group of the same name. It was constructed by the navy, and is considered the most difficult work of its kind ever attempted by the department. The structure is 1,001 ft. long, 32½ ft. deep, 114 ft. wide at the bottom, and 138 ft. wide at the top.

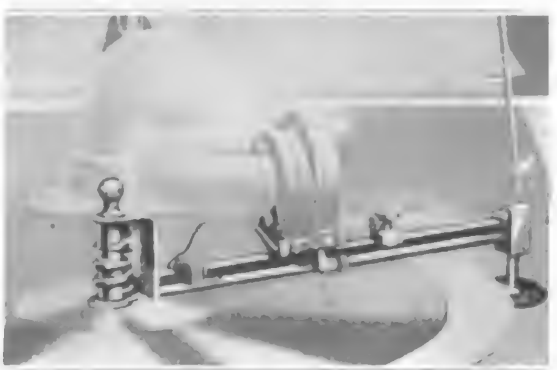
## TRACTOR SAWS DOWN TREES BY SIMPLE ARRANGEMENT

Tractors are not being given much chance to rest, because their farmer owners are constantly discovering new uses for their power. Rather unusual is the application of a Minnesota farmer, who is using his tractor for cutting down trees. A timber frame on the front of his machine holds a vertical shaft, at the bottom of which is mounted a circular saw. Gearing at the top allows the saw to be run by a belt from the tractor's power pulley, and to be fed by moving the tractor forward.

Timber Frame Rigged on Front of Tractor, with Belt-Driven Circular Saw at Bottom of Vertical Shaft, for Cutting Down Trees

## PHONOGRAPH REPEATS RECORD WITH NEW ATTACHMENT

When the needle comes to the end of its travel and the music ceases, the owner of a phonograph equipped with the latest attachment takes no heed, and a moment later the machine is playing the same air over again. This interesting result is achieved by means of a metal arm pivoted at a point outside the turntable, its inner end resting upon the projecting tip of the spindle. At the end of the record, the traveling sound box engages a trigger which actuates a vertical screw, and the metal arm rises, lifting the needle from the record. The sound box slides back along the inclined arm to its starting position, the descending arm replaces the needle accurately in the outer groove, and the music goes on.



New Phonograph-Record Repeater: An Attachment with an Arm Which Rises at the End of the Selection and Slides the Sound Box Back to the Beginning

¶ Rifle fire is recommended by the Navy Department Bureau of Ordnance for sinking drifting mines. Usually this method will not cause explosions, it is declared, but, as a measure of safety, it is advised that firing be done at 500 yd., and that crews of ships be protected from flying fragments even at that distance.

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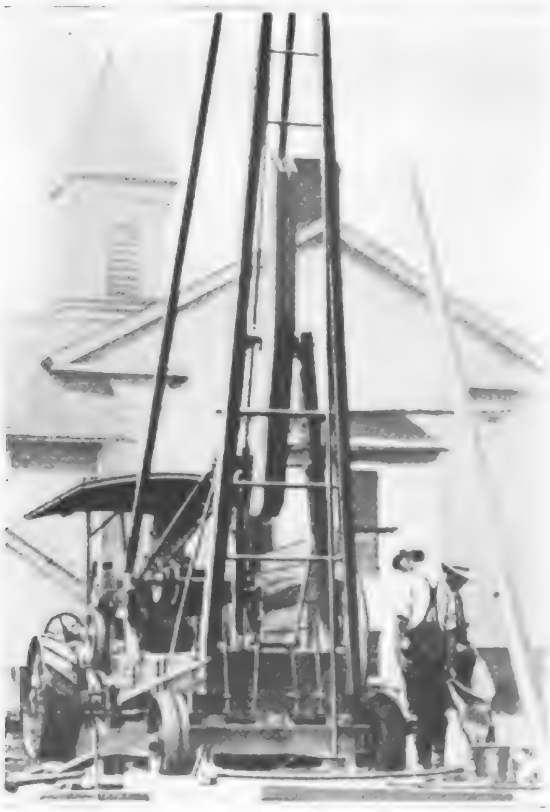
## OHIO VILLAGE TRANSFORMED BY DISCOVERY OF OIL

To the tales of strange results produced by oil discoveries should be added the story of the Ohio village (Chatham) that



Oil-Well Drill at Work in the Yard of an Ohio Village Church: The Town is Situated in the Center of a Recently Discovered Petroleum Field

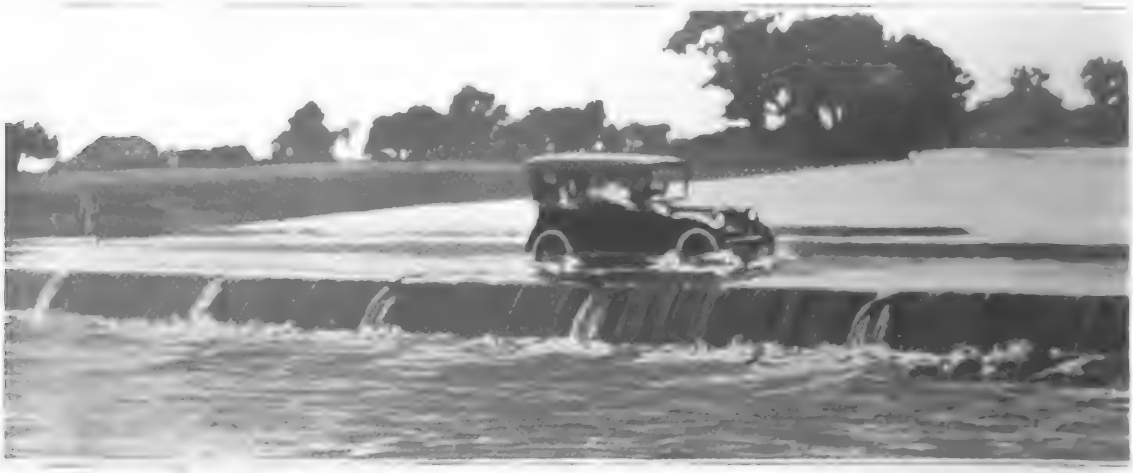
awoke one morning, a few months ago, to find itself in the center of a petroleum field. Drills were set up in every yard. Even the churchyard had its boring machine, placed within a few feet of the house of worship. A well was dug in the town's public square. It proved worthless, but 50 ft. away, in the dooryard of the only physician in the place, there are three valuable producers. The field is about 10 miles long a d five miles wide, and the oil is about 450 ft. below the surface. Some of the wells are producing as much as 250 bbl. of oil daily.

## LEAD-COATED TURBINE BLADES RESIST ABRASION BY SAND

Wearing away of water-turbine blades is caused by particles of sand suspended in the water, ultimately having all the effect of a sandblast. It has been discovered that a thin coating of lead, applied to the blades by the metal-spraying process, actually stops all abrasion, the sand instead driving the lead into even closer cohesion with the iron. The application of this process should prove valuable to hydroelectric plants.

## LEVEL FORD ACROSS RIVER ON TOP OF LOW DAM

The broad top of a low concrete dam across the Des Plaines River, near Chicago, forms a level, shallow ford which is used by automobiles and other vehicles, as well as by barefooted pedestrians. Crossing the structure in a motor car is a more or less thrilling experience, because of the water splashed by the wheels of the machine. It is, however, a perfectly safe trip. The surface of the submerged roadway is roughened to provide good traction.



A River Ford on Top of a Concrete Dam: Automobiles Splash through the Few Inches of Water That Flow over the Obstruction, While Pedestrians Remove Their Shoes and Stockings, and Walk Across

Against the Wall in the Picture on the Right is Seen the Inner Half of the Fortified Bank's Steel "Pill Box," with Its Slits Which Allow the Guard's Rifles to Command the Whole Interior. The Exterior View Below Shows That the Guard Box Also Covers the Bank Entrance and the Street. In the Lower Right-Hand Corner Is a Close-Up Study of One Projecting Half of the Bank's Steel Fort, with the Guard on Duty

## BANK GUARD STANDS WATCH IN LOOPHOLED TURRET

Bank robberies in the outlying districts of Chicago have become so frequent that one president adopted a suggestion from his son and cashier, formerly a lieutenant in the A. E. F. In France the son acquired a wholesome respect for the little steel and concrete "pill boxes" used with such murderous effect by the Germans. So the bank now boasts a steel "pill box" of its own. It replaces a large window and is located in a strategic corner, where the guard's high-power riot guns command every part of the interior and all exits. The fort being built half inside and half outside, the guard may miss his men within and still get them as they attempt to leave the building.

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¶Talking machines will play an important part in the presidential election campaign of 1920. Both the leading political parties have announced plans for distributing to all parts of the country phonographic records of speeches.

## RECLAMATION OF CITY WASTE ENCOURAGED BY GOVERNMENT

Though American industry prides itself on the value of its by-products, rescued in most part from so-called waste materials, the truth is that the mine of utility in the nation's waste has scarcely been touched. War needs brought to light vast supplies from unsuspected sources, in the shape of thousands of tons of discarded clothing, paper, and other familiar materials. The most important feature of this resurrection, still generally unrecognized, is not its monetary value, but its ability to replace natural products which are either practically exhausted or desperately scarce. That the systematic collection of this material is a work for the community, more than for the individual, is beginning to be realized. The city of Akron, Ohio, has already put such a campaign into action, and so well is it operating that the Waste Reclamation Service of the Department of Commerce has issued a special booklet on it for distribution to other organizations.

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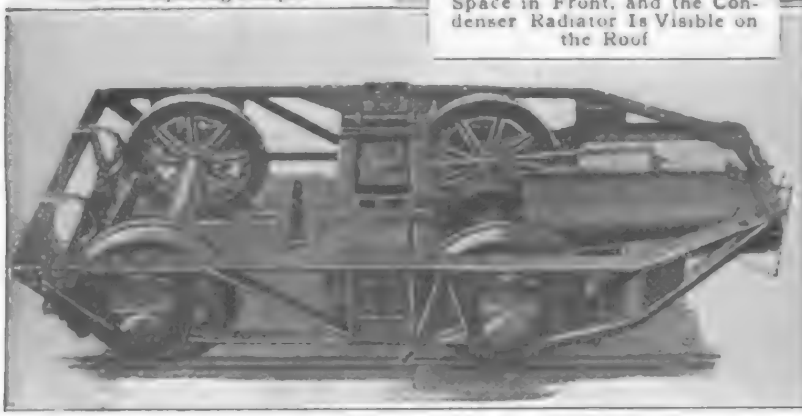
View of the Unit Car's Interior, Indicating That the Appointments Are of Standard Railroad Quality and the Spacing Ample

General View of the Unit Car: The Boiler Room Occupies the Space in Front, and the Condenser Radiator Is Visible on the Roof



**The Front Truck Carries the Engine, as Seen in the Left Picture. It Is of the Two-Cylinder Inclosed Type, the Forward Wheels of the Truck being Mounted Directly upon Its Crankshaft. At the Right Is the Compact Water-Tube Boiler, with Its Fire Box at the Bottom and Steam Drum at the Top**

## PONY ON MOTORCYCLE USED IN PUBLICITY CAMPAIGN

Although not to be recommended as a comfortable vehicle for cross-country travel, the motorcycle-mounted pony, recently displayed in an eastern city, served its purpose well—that of attracting attention. The steed, done in papier-mâché, was mounted on the sidecar chassis.

**The Fertile Imagination of the Advertising Man Is Responsible for This Odd Vehicle. On Its Trip through the City Streets the Steed Bore a Cowgirl**

## ENGINE AND COACH ARE ONE IN NEW RAILWAY UNIT

A railway coach which contains its own locomotive, steam-driven and burning petroleum in a modern water-tube boiler, has been produced as a cure for the economic distress on railroad lines whose passenger traffic is inadequate to meet the customary expenses. Externally the new car gives little indication of its power equipment. It is 50 ft. 7 in. long over all, and seats a total of 42 passengers, to whom it offers all the comforts and conveniences of modern railway practice. The 8-ft. boiler room, steel-lined, occupies the front end and contains an efficient water-tube boiler, burning crude or refined oil and generating steam at 700 to 1,000-lb. pressure, superheated to 650° F. The two-cylinder piston-valve engine is mounted directly on the front axle of the forward truck, and develops normally 60 hp., which in an emergency may be considerably increased. The condensing radiator is carried on the car roof. The car, which weighs about 30,000 lb., makes 45 to 60 miles an hour.

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## GIANT CAPRONI PLANE FALLS WITH FIFTEEN PASSENGERS

Most terrible and most mysterious of all airplane accidents was the fall of a giant Caproni, all ablaze, from a height of 5,000 ft. in Italy a few days ago, in which 15 passengers were killed. The big plane, which was attempting to make a new speed record from Venice to Milan, was seen suddenly to burst into flame near Verona. All on board, including seven newspaper men, one representing a Chicago paper, were burned to death, destroying any possible clew to the cause of the fire.

## ONE MACHINE PLANTS, ANOTHER DIGS. POTATOES

Potato growing has become almost an automatic industry with the improvement of specialized machinery for its operations. An interesting form of potato planter that has lately come into successful use carries the seed in nonclogging hoppers of canvas and drops them at specified intervals, in straight, regular rows, into a furrow it has plowed. A pair of disks at the rear then cover the seed, with which fertilizer may also be fed into the ground if desired. Equally valuable is a digging machine, which plows up the potatoes, catches them on a conveyor that shakes them clean, and lays them out behind ready for loading. The chain links of the conveyor are steel rods, 22 in. long, transversely mounted, making a ladderlike chain of great capacity that handles the potatoes without bruising them.

The Potato Planter Digs Its Furrow, Drops Seed from the Canvas Hopper, with Fertilizer if Desired, and Then Covers Them by Means of the Disks at the Rear. The Sectional View in the Corner Indicates How the Seed is Released by a Triple "Mechanical Hand"

As Seen Above, the Potato Digger Has On Wheel Bands for Hauling to and from the Field; the Digging Plow and Ladderlike Conveyor Are Visible. At the Right Is the Machine in Action

## NAVY DEPARTMENT COLLECTS PICTURES AND LETTERS

Photographs taken by private individuals in naval camps or aboard ships, personal letters written by sailors, and any other similar material that pertains to the activities of the navy during the war, are to be placed in permanent files at Washington, D. C., by the Navy Department. They will form a historical collection intended to preserve a viewpoint of the hostile times not contained in official documents. A request has been made that such items of interest be sent to the historical section of the department for examination. Description should accompany photos.

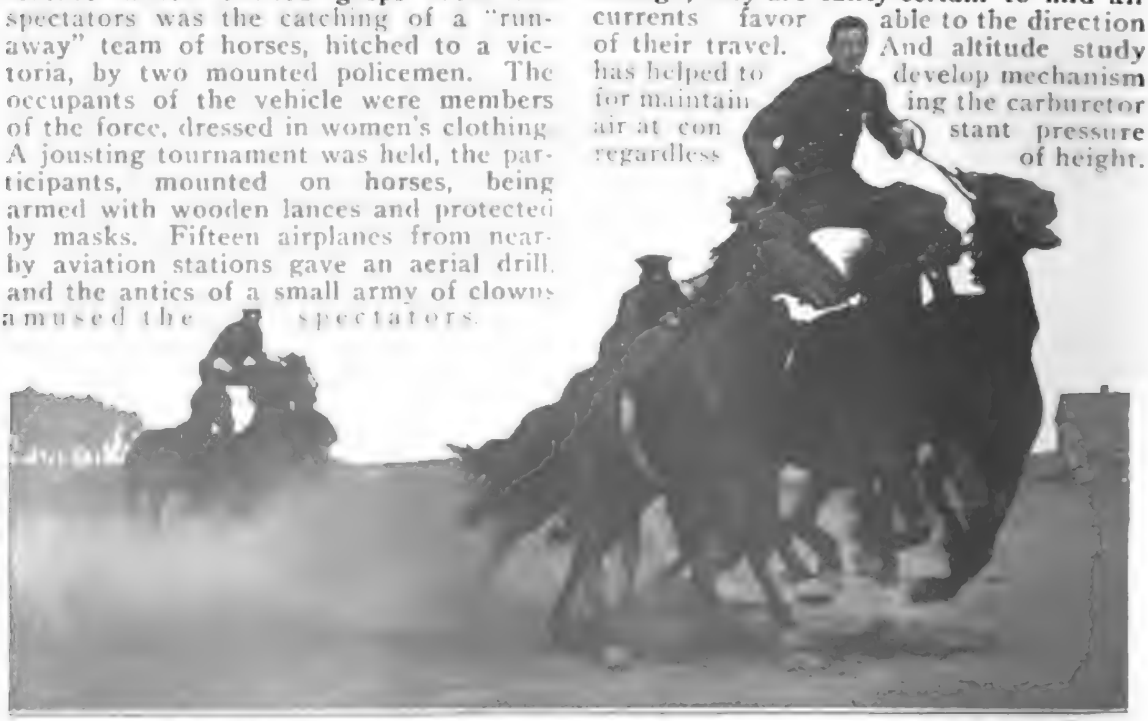
## MOUNTED POLICEMEN THRILL THOUSANDS AT CARNIVAL

Hair-raising feats of daring and skill thrilled the thousands who attended the carnival of the New York City police department at Sheepshead Bay recently. Of particular note were the horsemanship exhibitions. These included a sensational Roman race, in which each rider guided three barebacked horses, running abreast, while standing with a leg on each of the outside animals. Another feature which elicited gasps from the spectators was the catching of a "runaway" team of horses, hitched to a victoria, by two mounted policemen. The occupants of the vehicle were members of the force, dressed in women's clothing. A jousting tournament was held, the participants, mounted on horses, being armed with wooden lances and protected by masks. Fifteen airplanes from nearby aviation stations gave an aerial drill, and the antics of a small army of clowns amused the [illegible] spectators.

Stopping a "Runaway": Two Mounted Policemen Dashingly "Rescued" Other Members of the Force, Dressed in Women's Clothing and Riding in a Victoria

## VALUE OF ALTITUDE FLIGHTS TOLD BY RECORD HOLDER

The serious significance and importance of experimental flights at extreme altitudes was described by Roland Rohlfs just after the recent triplane flight in which he established the American record of 30,700 ft. While such events carry a sporting flavor, their real value lies in the new meteorological fields they explore, and the scientific observation, available in no other way, that they make possible. Conditions of temperature—as low as 25° below zero in midsummer—of air rarefaction, of wind velocities as high as 200 miles an hour, of the physiological effects of altitude, are some of the facts now recordable, but hitherto considered only theoretically. Of equal importance is the study of engine behavior under the influence of cold and rarefaction. The successful routing of air lanes for future commercial flight depends upon the study of the greater speeds possible at higher ranges, the change in wind direction in various strata, and other carefully recorded data. Experienced fliers already know that by going high enough, they are fairly certain to find air currents favorable to the direction of their travel. And altitude study has helped to develop mechanism for maintaining the carburetor air at constant pressure regardless of height.



One of the Sensational Features of the New York Policemen's Carnival at Sheepshead Bay Was a Roman Race, in Which Three Barebacked Horses were Ridden by Each Participant, as Shown in the Picture

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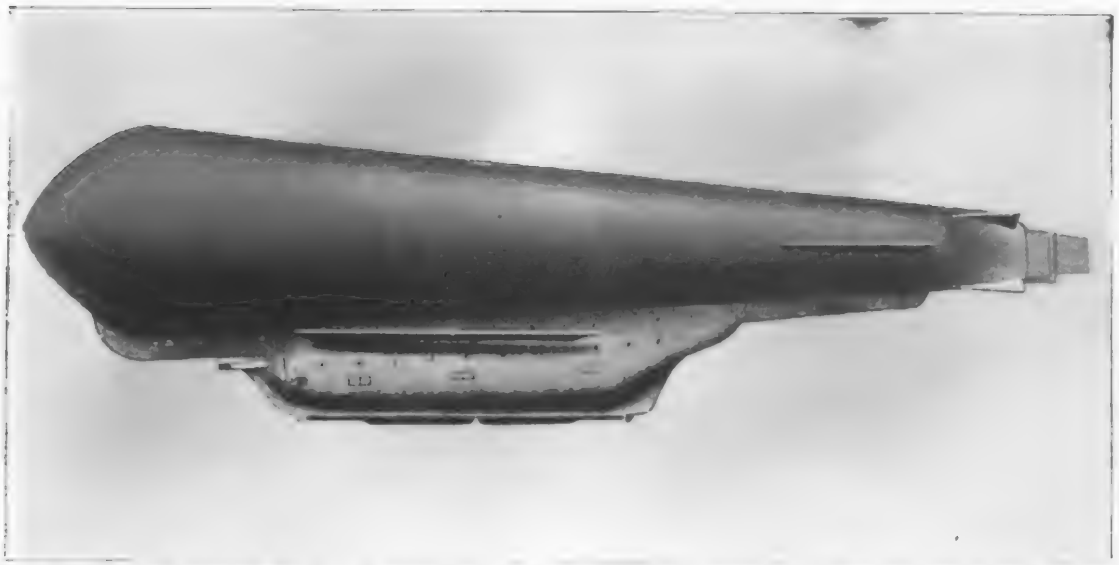

The "Thermos Bottle" in Flight: Revolutionary in Construction and Principle, This Steam-Driven Airship, Constructed Entirely of Metal and Depending for Its Buoyancy on the Lifting Power of Heat-Expanded Air, Claims Immunity against the Fate of So Many Lighter-Than-Air Craft—Destruction by Explosion of the Gas Bag—and Greater Safety from Purely Mechanical Accidents. The Nacelle, Built Integrally with the Envelope, Is Sturdy Enough to Travel the Sea Supporting the Whole Ship

# RIGID ALUMINUM DIRIGIBLE GIVEN BUOYANCY BY HEATED AIR

By RALPH C. BUSBEY

THE world's first all-metal dirigible, a monster, steam-propelled "thermos bottle" buoyed up by heated air, is now under construction, and before the end of the current year is expected to make its maiden trip across the Atlantic Ocean. The inventor has secretly labored on his unheard-of craft for six years, spurred on to increased activity during the last few weeks by the "blimp" disaster which horrified the city of Chicago. Because that holocaust, he believes, showed the world that the commercial dirigible of the future must be something other than a combustible combination of hydrogen gas, thin silk, fragile framework, and fire-spitting gasoline engines, he feels that the very same disaster which overtook the "Wingfoot Express" lurks in the gas-filled ballonets and complicated framework of the "R-34" and every other dirigible now in operation. Such a disaster, with the elaborate, costly precautions taken against a recurrence, have led him to believe that airplane and dirigible construction must be completely revolutionized in order to insure that degree of safety without which the phase of commercial utility cannot be reached.

Of course, the use of helium gas—the United States' war achievement—which is noninflammable, would obviate the danger, but this has not yet been produced in sufficient quantities to make it commercially available.

"Revolutionary" is exactly the word to describe the steam-driven, noncollapsible cruiser of the skies on which the inventor is now at work; it is revolutionary in both principle and design. For the "gas bag" is really no bag at all; rather a truncated portion of a slender cone, streamlined at bow and stern, and constructed throughout of a light, strong aluminum alloy. Rigidity is furnished by a central longitudinal tube, 6 in. in diameter, from which radiate "spokes," as in a bicycle wheel, every 15 ft., this odd construction eliminating all chance of structural failure and collapse. Transverse diaphragms, or partitions, also every 15 ft., divide the 388 ft. of the length into 20 hot-air compartments with a capacity of some 500,000 cu. ft., leaving 31 ft. at the bow for streamline, with 57 ft. at the stern for streamline and rudders.

The craft derives its aerial buoyancy from heated air which is maintained at a determined temperature by large kerosene burners, placed beneath each of the 20 compartments. Expansion and consequent rarefaction of the heated air is provided for by valves automatically controlled from the pilot's cabin. Similar valves, with suction fans and pumps, permit rapid intake of cool air for descent, when it is desired to cruise at a lower altitude. To prevent loss of this heat to the outside air during normal,



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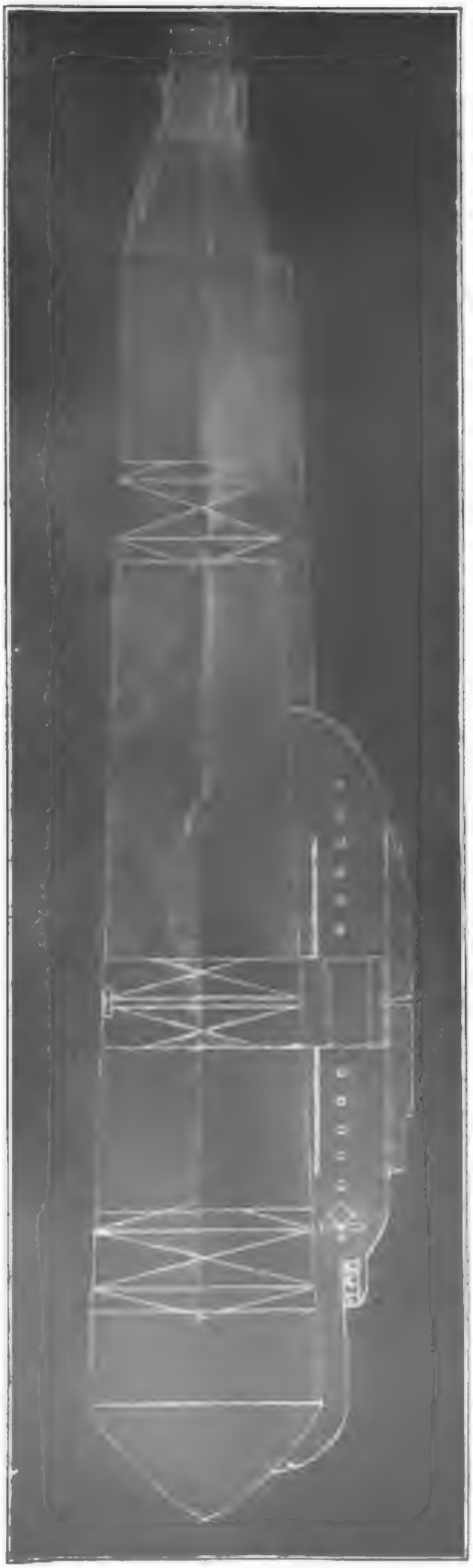

This Diagram Gives an Idea of the Shape and the Interior Construction of the Dirigible. Portions of the Envelope being Cut Away to Show the "Wire Wheel" Bracing and the Air Chambers. The Hinged Members at the Bottom of the Hull Serve as a Stabilizer in the Air and as a Keel on Water

horizontal flight, however, the taut metal envelope is double-walled throughout its length, the intervening 4-in. space being filled with a special insulating material. The composition of this insulation is naturally one of the inventor's most jealously guarded secrets. It is evident, nevertheless, that such insulation will not only conserve fuel, but will make the dirigible insensible to the variations in atmospheric temperature which so seriously affect the ordinary "thin-skinned" dirigible. It is this "lining," by the way, combined with the gleaming metal skin, which has prompted the inventor's associates to nickname his craft the "Thermos Bottle."

Carried under the forward part of this metal "gas bag," and forming an integral part of the structure, is the metal gondola, about 160 ft. long, and of seaworthy construction fit to withstand the heaviest seas. Herein is the navigator's cabin, containing controls to fans and air pumps, thermostats which regulate temperatures in each of the 20 air compartments, means for lowering the centerboard keel for travel on the water, as well as all the conventional navigating controls and instruments. In the engine room is generated steam which not only enables three engines of 1,500 hp. each to turn the great air propellers, but even circulates through radiators in passenger cabins, crew's quarters, and recreation salons, insuring comfortable warmth at the highest altitudes. The inventor's consistent purpose has been to provide the traveler with every comfort he has grown to expect on the large ocean liners, not the least of these being the passenger's freedom to smoke his cigar in any part of the interior.

The performance of the all-metal, hot-air dirigible is now admittedly a matter of conjecture. Free from the usual aerial dangers of fire and collapse it certainly will be. It should be efficient in speed and lifting power. When heated to 200° F., it is computed that the air in the 20 compartments will possess a lifting power of 10,280 lb., or more than five tons. And as the kerosene heaters are designed to raise the temperature to 700° F., if necessary, it is seen that the lifting power will be ample to insure commercial profit. And for use in war the hot-air dirigible will be without a peer. Battling a fleet of hydrogen-filled Zeppelins, it should send them one after another to blazing destruction, though half its own hot-air compartments be riddled by incendiary bullets.

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# GOATS USED IN TESTING POISONOUS WAR GASES

One of the Herds of Goats Kept by the Government for Testing Poisonous-Gas Shells Made for the Army during Hostilities: The Horned Animals Have High Powers of Resistance against All Gases

Goats were used to test poisonous gases made for the army during the world war, it became known recently when some of the secrets of the Chemical Warfare Service were revealed by military authorities. Large herds were purchased by the government after it was learned that the animals possess strong powers of resistance against practically all gases, and the beasts were kept at plants where gas shells were manufactured.

Goat Trench for Gas Tests: A Gas Shell was Exploded near the Goats, and Afterward They were Killed and Their Lungs Examined

In making the tests, a few goats were placed in a trench, similar to those used by soldiers, and a gas shell was exploded near them. Immediately afterward, these animals were killed and their lungs examined to ascertain the effects of the poison. Using this information, experts compiled tables to indicate the number of shells of a certain strength necessary to explode in a given area in order to obtain the maximum results.

Toxic gases caused from 25 to 30 per cent of the casualties of the war, but only about three or four per cent of the gas cases resulted fatally.

## VERTIGO AFTER TAIL SPIN IS DANGER TO FLIERS

Vertigo following a tail spin, voluntary or involuntary, is a familiar phenomenon to fliers, and is, of course, nothing more nor less than the natural sense of dizziness after a whirl. The victim continues to imagine rotation after he has stopped. As a result, on straightening out he is likely to operate his controls too far in the reverse direction, and so actually go into another undesired tail spin the opposite way. Officers who have studied the condition and its dangers have found that holding the head well down under the cowl during a spin, to some extent overcomes the misleading sensation by centering the rotation about the long axis of the pilot's head. On coming out of the spin the continued sensation of whirling is then in a horizontal plane, and much less dangerous, because it does not tempt the flier away from an even keel.

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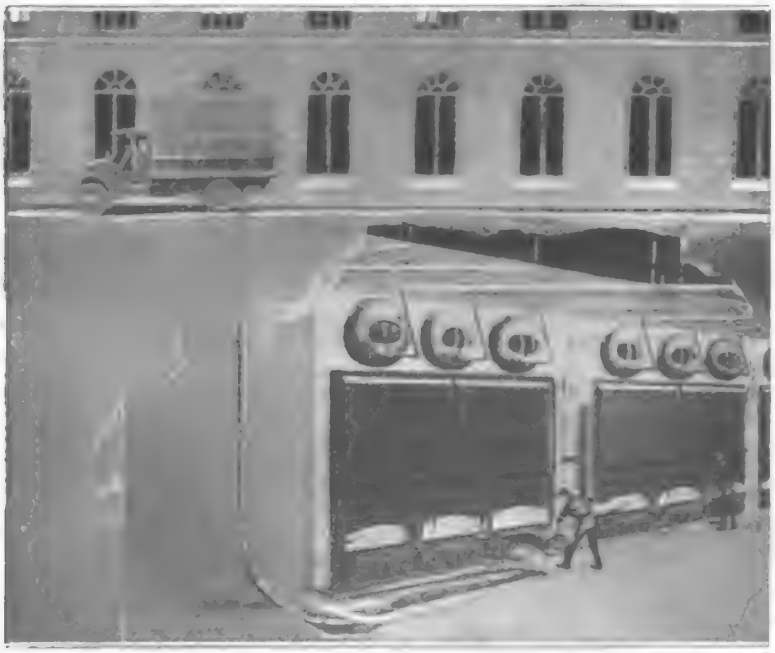
## REMOVING ASHES BY SUCTION SAVES LABOR AND DUST

Ashes are now being removed from certain large buildings in New York City by a sort of magnified vacuum-cleaner system, with entire success and relief from dust. Before the boiler plant in each building is a concrete pit, three feet in width and depth, from which a pipe extends to the street level and terminates beneath the sidewalk. A truck carrying the apparatus connects its suction pipe with this terminal, and a powerful blower quickly extracts the ashes, which enter a bin and are subsequently dumped into another truck to be carted away. The waste air is washed to remove dust before being discharged.



From the Concrete Ash Pits in Front of the Boilers, a Pipe Extends Up to the Street, and a Vacuum-Cleaner Truck Quickly Draws Out All the Ashes; the Truck Has Dump Sides and an Air Washer

## COATINGS PROTECT CONCRETE FROM SEVERE HEAT

Concrete made with coarse gravel is capable of withstanding heat with less danger of disintegration if protected by a coating of cement, 1 in. thick and reinforced with wire mesh, according to the Bureau of Standards. Plasters made with asbestos as their chief ingredient can be used for the same purpose. High temperatures cause stones to burst, which results in damage to the material in which they are imbedded.

## WANT SEMIAUTOMATIC RIFLE FOR AMERICAN ARMY

Inventors are asked by the U. S. War Department to submit designs for a new semiautomatic shoulder rifle, to use, preferably, the standard .30-caliber cartridge. Simplicity, ruggedness, and resistance to sand, dust, and water are primary requirements. The arm must not weigh over 10 lb., and its clip-loading magazine should hold preferably 10, and at least five cartridges. Normally firing once for each trigger pull, it should also be usable as an ordinary hand-operated magazine rifle. Emphasis is placed on the desirability of following as far as possible the design and construction, and using parts of the present standard service arms. Some of the special requirements are that the breech block must be locked to the barrel while firing, that an effective safety device must be provided, and that dismounting should be accomplished with one tool, preferably with a cartridge.

## DERANGED CAPTAIN PERILS SCHOONER AND CREW

With an insane captain in charge, a small wooden schooner and its crew of seven men came near being lost recently when the vessel encountered a severe storm off the coast of Wales on a voyage from Swansea, England, to Calais, France, with a cargo of coal. The master's derangement first became apparent when he ordered sails hoisted while the gale was blowing strongly, and headed the craft shoreward. When land was sighted, he demanded that the schooner be run ashore, at the same time issuing other absurd commands. Then the mate took charge of the battered ship, and finally hailed a tug to tow the vessel to port. In the meantime, the captain continued his eccentric actions, and terrorized the crew by firing a revolver at various objects. After wounding one man, he was made a prisoner in his cabin, where he shot himself through the head and died.

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# TWO HUNDRED EAT BREAKFAST AT OUTDOOR TABLE

The Culinary Department: Some of the Mountain Trout That Delighted the Visitors are Pictured, Ready for the Hands of the Cooks. On the Stove in the Background are to be Seen Pots of Steaming Coffee, Which Added to the Pleasure of the Repast

While the Hungry Guests Eagerly Awaited Their Meal, a Burlesque Labor Strike was Staged by the Volunteer Waiters, Who are Shown Here Dramatically Voting in Favor of a Walkout

Western Hospitality Extended to a Party of More Than 200 Easterners on the Pacific Coast: Breakfast was Served on a Table 300 Feet Long, Built beside a Winding Mountain Stream, by 50 Business and Professional Men from a Near-By City. Trout and Bear Meat Were the Principal Dishes



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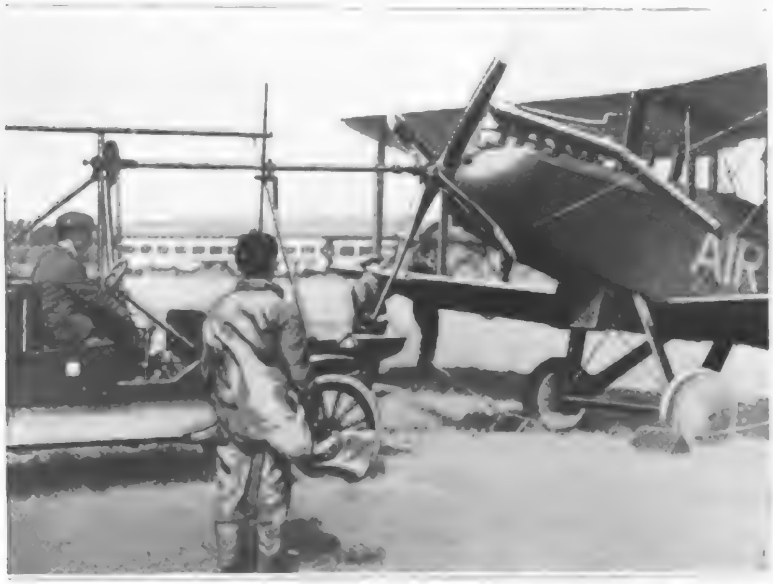
## PORTABLE AIRPLANE STARTER SAVES LABOR AT AIRDROMES

In view of the search being conducted by our own army air service for a satisfactory airplane cranker to be used about its flying fields, attention is drawn to a British mechanism of the kind. A horizontal shaft at the height of the propeller hub is mounted on an automobile chassis and revolved by a chain and sprocket from the engine. At the working end of the shaft is a universal joint and socket by which the connection with the propeller is made. On its automobile mounting the apparatus may be rushed quickly to any part of the flying field.



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**This Auto-Mounted Airplane Starter is Finding Favor in England as a Substitute for the Dangerous Method of the Past, Responsible for the Mutilation and Death of So Many Mechanics**

¶ Bags of aerial mail dropped at Sacramento, Calif., will be caught in a large net installed on the Federal-building roof.

## COLLECTIVE-OWNERSHIP PLAN FOR FLAT BUILDINGS

Six modern apartment buildings, located in an exclusive suburb of New York City, are jointly owned by the tenants of the 60 suites in the structures, who manage them coöperatively. The collective-ownership plan was suggested in newspaper advertisements by the corporation that erected the buildings, shortly after their completion recently, and more than 1,000 letters of inquiry were received as a result. Out of this number of interested persons, a list of desirable purchasers was selected. About half of those who bought were living in the buildings at the time the sales were made. Many prominent residents of the metropolis became owners of suites. Plans have been made and funds provided for the erection of other high-class apartment buildings in the same locality, to be operated by the occupants.

## PLAN LONG CONCRETE BRIDGE OVER MOHAWK RIVER

Work on one of the longest concrete bridges in the world will begin soon at Schenectady, N. Y., where a beautiful structure of this type is to be built across the Mohawk River and the New York State Barge Canal. According to the plans, the bridge will be 4,436 ft. long, and will comprise 24 spans, ranging in

Proposed Concrete Bridge over the Mohawk River and the New York State Barge Canal at Schenectady, New York. This Illustration Shows How the Structure will Appear When Completed. Twenty-Four Spans, Costing about $1,423,000, are to be Erected with Public Funds

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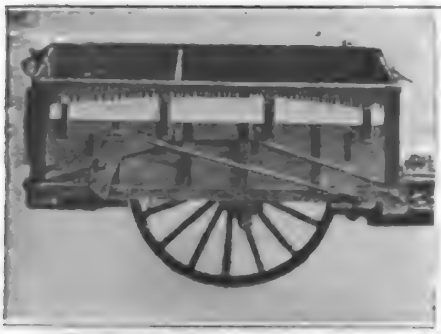
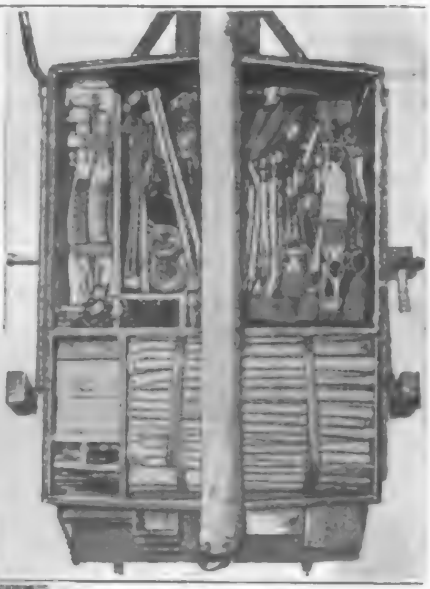


That the Tool Wagon Is an Extremely Substantial Affair may be Gathered from the Side View at the Left, in Which the Heavy Iron Reinforcements are Visible. Below, the Contents of the Vehicle are Seen Spread Out, from Which Its Capacity may be Realized



The Top View, Above, Gives the Best Idea of the Wagon's Ability to Carry Tools, and Also Shows the Waterproof Canvas Cover, Rolled Up

length from 106 ft. to 212 ft. There will be a 40-ft. roadway, flanked by sidewalks, 6 ft. wide, on top of the arches, while a 100-ft. parkway, 300 ft. long, will lead up to the abutment on the Schenectady side. Street-car tracks will be laid in the center of the roadway. Public funds will be used to erect the great spans, which will cost, it is estimated, about $1,486,000. The approaches and abutments alone will mean an outlay of $200,000. Separate contracts will be let for different phases of the work, which is expected to be completed in 1921. The projected bridge will serve instead of an ancient steel toll bridge, now standing, which is crossed by approximately 150,000 pedestrians and 9,000 automobiles each week.

## CAISSONLIKE TOOL CHEST HOLDS MANY SUPPLIES

War created many ingenious devices, developed in the time of stress to aid the fighting men on the battle field, but capable of adaptation to the needs of peaceful industrial armies. One of these is a mobile tool chest, resembling a field-artillery caisson, in which are packed implements and supplies in great variety and quantity. It is recommended for building contractors, lumbermen, road builders, and others who require a compact, easily moved tool carrier. The body of the conveyance is of wood, reinforced with wrought iron, and divided into compartments. Two sturdy wheels carry the

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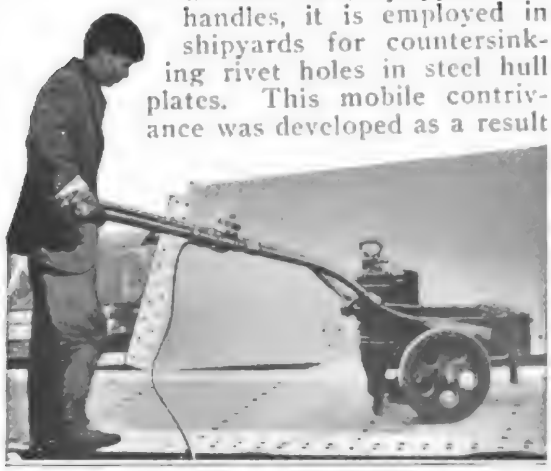
load. A heavy canvas cover is provided. Among the articles packed in the box are shovels of different sizes, axes, picks, mattocks, mallets, sledge hammers, pliers, wrenches, extra handles for axes and picks, ropes, pulleys, and wire, besides many others. The cart can be hauled by two men, or attached behind a wagon or truck.

## RIVET HOLES COUNTERSUNK WITH ELECTRIC DRILL

Another use has been found for the electric drill. Placed on a weighted, two-wheeled cart, equipped with handles, it is employed in shipyards for countersinking rivet holes in steel hull plates. This mobile contrivance was developed as a result



**Using a Special Portable Electric Drill in a Shipyard for Countersinking Rivet Holes in Steel Hull Plates**

of the discovery that protruding rivet heads reduce the speed of boats and gather floating vegetation. A special bit is used, this being designed to cut depressions around the edges of rivet holes up to 1 in. in diameter. Only seven seconds are required to countersink a ⅞-in. hole, it is declared.

## MAMMOTH VESSEL WITHDRAWN FROM TRANSPORT SERVICE

Another transformation is planned for the "Leviathan," formerly the liner "Vaterland," one of the large German ships seized by the United States when this country entered the war, and used since as an army transport. The vessel will soon be withdrawn from this service, and will become a charge of the Shipping Board, which will refit it for passenger and commercial voyages. While nothing definite has been decided for the future of the "Imperator," sister ship of the "Leviathan," the ship recently made its final trip as a transport.

## SOLID PARAFFIN EMPLOYED IN FACIAL OPERATIONS

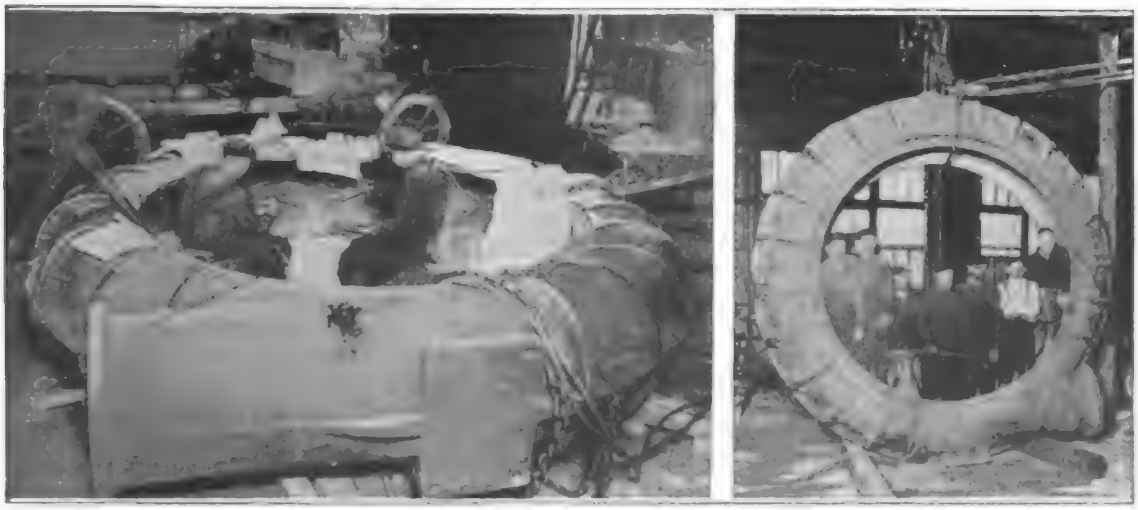
Paraffin is used by an English surgeon for filling depressions in the faces of patients by placing the wax under the skin in a solid state, instead of melted, as has been done generally in the past. The method followed is very simple. After the material has been sterilized by heating, it is poured into a basin and allowed to solidify. It is then broken up, and a piece of the proper size is shaped with a knife to serve the purpose for which it is intended. A small incision is made in the skin at the point where it is desired to insert the paraffin, and the bit of wax is pushed through the opening. The operation is completed by sewing the edges of the cut together with fine catgut. Melted paraffin, introduced under the skin by means of a syringe, has proved unsatisfactory in a number of respects.

## WINDMILL WHEEL OPERATES MAKESHIFT WOOD SAW

Crude in appearance, but efficient in operation, a makeshift power wood saw assembled by an aged Californian is driven by air currents. The wheel of a windmill is mounted on a frame of timbers in such a manner that, when it is turned by a breeze, power is transmitted through a belt to a mechanism which operates a form of jig saw, the vertical blade of which was taken from an ordinary buck-saw. Wood is cut by placing it on a

**Wind-Operated Wood Saw: When the Windmill Wheel Turns, the Blade is Given a Reciprocating Motion. The Inventor Earns His Living by Sawing Firewood with the Device**

movable table, and pushing it against the teeth of the moving blade. The inventor earns his living by sawing firewood with the contrivance.



Relining the Circular Chamber of a 14-Foot Centrifugal Pump by the Acetylene-Torch Process: In the Left Picture the Men are Seen Welding the New Steel into the Worn Casing, with Aid of Oxyacetylene Blowpipes, and the Right View Shows the Job Finished and the Chamber, "Better than New," Ready for Work Again at One-Third the Cost of a New Casting

## HUGE PUMP RELINED BY OXYACETYLENE PROCESS

The great centrifugal pumps, or "sand-suckers," used for dredging silt, sand, mud, and gravel from river and harbor bottoms, are subject to excessive wear from the constant friction of abrasive particles against the inner walls of the pump chambers. To replace one of the worn-out castings commonly requires 10 to 12 weeks, during which dredge and crew grow rusty in idleness. By the use of the oxyacetylene weld, however, it has been found possible to rebuild one of the huge chambers in less than a week, and at one-third the cost of a new casting. The demonstration was made with a chamber measuring 14 ft. in outside diameter, and weighing seven tons. Working in relays, two men at a time, the inner surface was rapidly built up to its old dimensions by the addition of a toughened steel. As the added metal varied between one and a half and two and a half inches in thickness, 1,264 lb., or more than half a ton, were needed to complete the rebuilding. It is believed that the repaired pump is more serviceable than the original.

## BEES FOLLOW FLOWER-LADEN AIRPLANE

The Flower-Laden Airplane, on Its Way to a Flier's Funeral, was Followed by a Huge Swarm of Bees

The owner of a large apiary in southeastern Missouri is mourning the loss of half his million bees, lured from home by a passing airplane. The plane was on its way to the funeral of a former lieutenant of the air service, the after cockpit heaped with fragrant magnolia blossoms and trailing a magnificent wreath. Passing over the bee farm, the alluring odor was wafted to the hives. The bees swarmed at once, and were last seen as a large cloud dwindling into the far west after the fleeing airplane. The strange chase continued for at least 20 miles.

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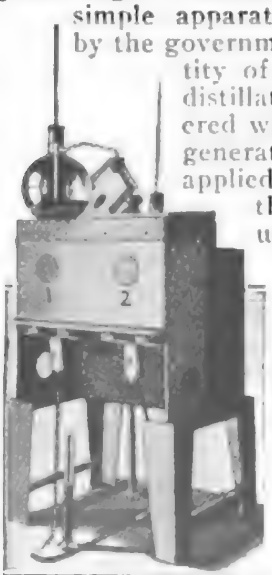
## HONOR MARINE-CORPS DRUM WITH WOUND STRIPE

Glory was not won by men alone on the battle fields of the world war. To illustrate, there is the bass drum which returned from France recently with a regiment of the Marine Corps, decorated with a wound stripe and four service chevrons. These marks of honor were painted on one head of the instrument, along with the insigne of the corps and that of the division to which the regiment was attached. The wound stripe was considered appropriate after the drum had been damaged by a bursting shell.

## SIMPLE MACHINE MEASURES MOISTURE IN GRAIN

Grain inspectors determine the exact percentage of moisture in samples by a simple apparatus recently adopted by the government. A certain quantity of grain is placed in a distillation flask and covered with mineral oil. Heat generated by electricity is applied to the flask, with the result that moisture is driven from the grain in the form of vapor, which is condensed in a tube leading to a glass container, graduated to indicate moisture percentages. A test requires from 25 to 30 minutes. Six compartment machines are used in the larger mills, elevators, and laboratories.




¶A new airplane record of 2 hr. 15 min. from Turin, Italy, to Rome, a distance of 362 miles, was recently established by a biplane with a 700-hp., 12-cylinder engine.

## MUNICIPALITY OFFERS PIERS TO SHIPPING BOARD

Piers to accommodate the 1,000-ft. steamships to be built by the Shipping Board have been offered to that body by the authorities of New York City, who are desirous of preventing the erection of docks for the vessels at Fort Pond Bay, L. I., as proposed by the government. One of the piers mentioned as suitable for use by the large boats was constructed at a cost of $5,500,000, and the municipality offers to rent this structure to the board for 7½ per cent of its cost annually, or $412,500. The city government also expresses its willingness to build another pier of similar size alongside the one now standing, if it is considered necessary.

## METAL TIRE CASE DESIGNED FOR SMALL AUTOMOBILE

Protection from thieves and the elements is given by a metal tire case that was placed on the market not long ago. It is designed to be affixed at the rear of a certain type of small car. The accessory is shaped like a casing, and is of such size that a tire for the machine for which the case is intended fits perfectly inside. A special bracket is supplied for attaching the device to the car. It can be fastened with a padlock provided for that purpose.

## "AIRSHIP" AND "AIRPLANE" OFFICIALLY DEFINED

Hereafter the word "airship" may not properly be applied to any kind of plane, but will designate only the class of flying craft that are lighter than air, such as dirigible balloons and other forms of aerial gas bags. The term "airplane" will mean any flying machine that is heavier than air, and is lifted by the power of its motors. The U. S. Air Service has made these definitions official, with the purpose of putting an end to the rapidly growing confusion in the nomenclature of the aerial profession. This distinction has been consistently followed by Popular Mechanics Magazine for several years past.

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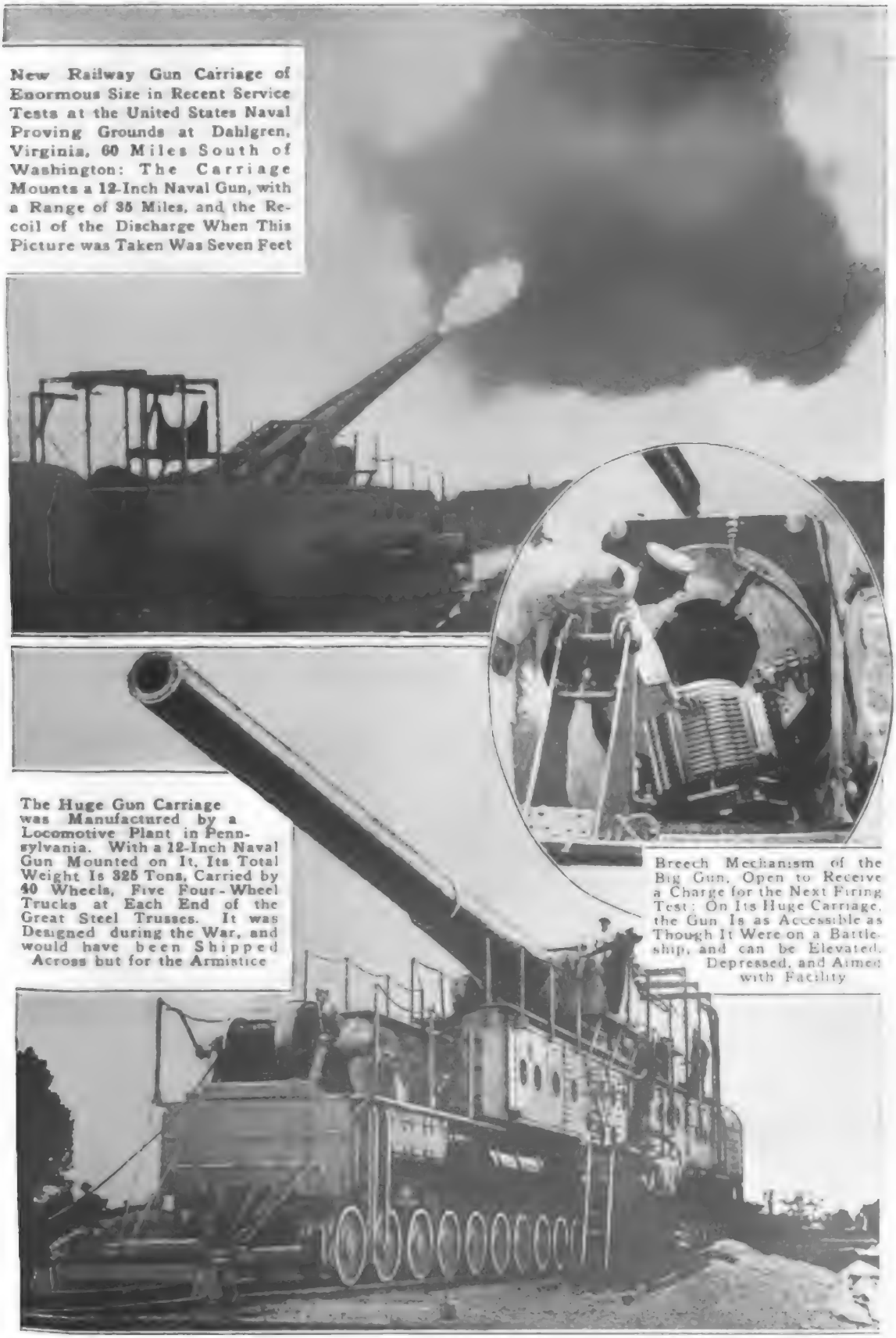
# GIANT RAILWAY GUN CARRIAGE IN SERVICE TEST



New Railway Gun Carriage of Enormous Size in Recent Service Tests at the United States Naval Proving Grounds at Dahlgren, Virginia, 60 Miles South of Washington: The Carriage Mounts a 12-Inch Naval Gun, with a Range of 35 Miles, and the Recoil of the Discharge When This Picture was Taken Was Seven Feet

Breech Mechanism of the Big Gun, Open to Receive a Charge for the Next Firing Test: On Its Huge Carriage, the Gun Is as Accessible as Though It Were on a Battleship, and can be Elevated, Depressed, and Aimed with Facility

The Huge Gun Carriage was Manufactured by a Locomotive Plant in Pennsylvania. With a 12-Inch Naval Gun Mounted on It, Its Total Weight Is 325 Tons, Carried by 40 Wheels, Five Four-Wheel Trucks at Each End of the Great Steel Trusses. It was Designed during the War, and would have been Shipped Across but for the Armistice

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## SMALL INDUSTRIAL TRACTOR ACTS ALSO AS TRUCK

Industrial tractors, for hauling purposes around warehouses and yards, are coming into almost as extensive use as their agricultural prototypes. As a rule they are locomotives only, and carry no load. A new three-wheel model designed by an Illinois concern is peculiar in the possession of a capacious body, which can be dumped with a hand winch, enabling it to serve as a small but efficient truck.

**Industrial Tractor Equipped with a Small Truck Body, Enabling It to be Used Independently of Trailers for Carting Work: The Body is Dumped with a Hand Windlass Whose Cable Runs over a Mast**

## ARCTIC EXPLORERS ON FLOE FOR FIVE MONTHS

Scientific data of considerable value were obtained by a party of 15 men who returned to civilization recently after spending about five months on a drifitng ice floe in the Arctic Ocean. Special attention was given to the study of currents in Beaufort Sea, that part of the ocean which stretches north of Alaska and Canada as far as Banks Land, and numerous soundings were made in the cold waters. It is the opinion of the explorers that land exists farther north than the point reached by them, latitude 74° north. The floe on which the strange voyage was made was seven miles wide and 15 miles long. Many seals, polar bears, ducks, and land birds made their homes on the floating block of ice. Plans had been made for remaining on the floe for a year or more, but these were abandoned when the leader of the party became ill.

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**STREET TRAFFIC SPARED AS FREIGHT CARS VAULT FROM BRIDGE**

**THIS railroad smash-up at Springfield, Ill., was unusual both in itself and in the number of hairbreadth escapes it involved. The cause of the mishap is undetermined; but it is believed that a dragging brake beam lifted one of the freight cars several feet off the track, whence it fell sidewise, with two others, into the street below. There is no uncertainty about the hairbreadth escapes, however, as the plunging cars were seen to miss by a few feet a pedestrian, a motorcyclist, an automobile, and a street car. No one was injured.**

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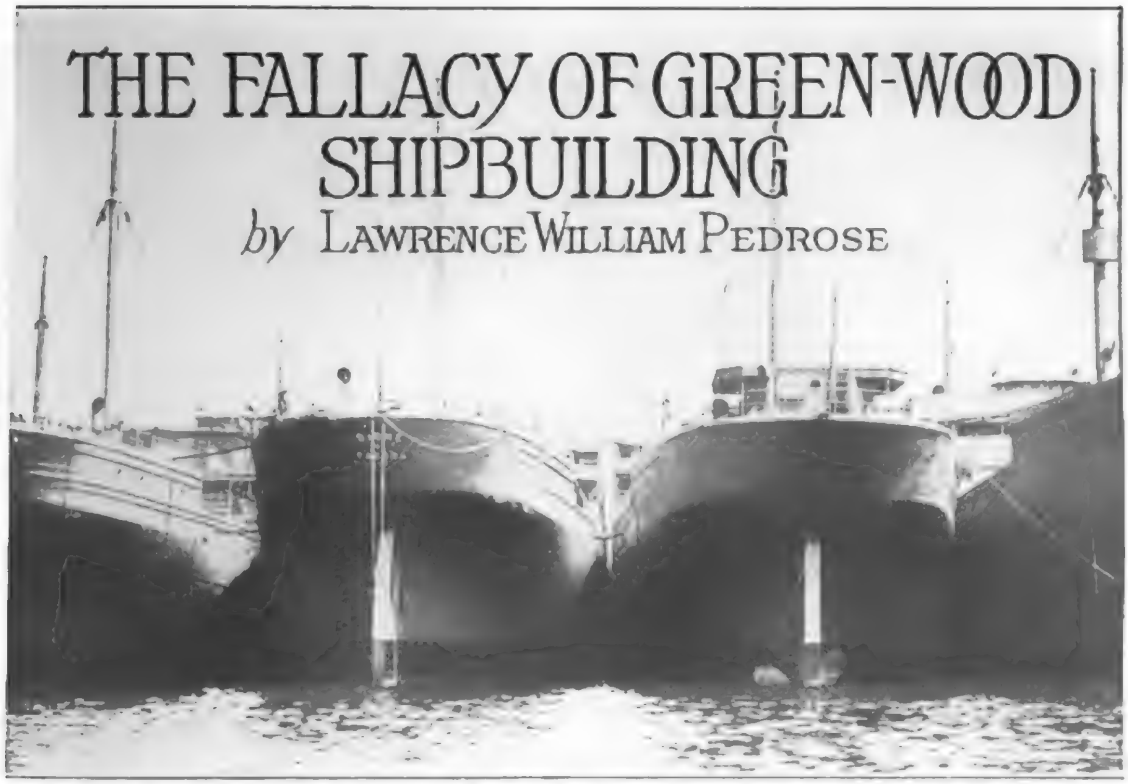
# THE FALLACY OF GREEN-WOOD SHIPBUILDING

*by* LAWRENCE WILLIAM PEDROSE



**Of the Ships Shown Here, the Three to the Right Are the "Dione," the "Elestra," and the "Cineas." They Are Part of a Long Row Anchored in Lake Union, Seattle. None of the Photographs Used with This Article have been Retouched**

MAGAZINE HAS WILD TALE: In the July issue of Popular Mechanics is printed the startling assertion that lying idle on the Pacific coast is a fleet of more than 50 wooden steamers that will remain idle until they fall apart, because of green timber used in their construction that unfits them for service.

Builders along the Pacific coast are asking each other in what particular secreted "snug harbor" has Uncle Sam hidden these specimens from the gaze of his people? Certainly they are not in the Columbia River, Grays Harbor on Puget Sound, or in California ports.

In connection with the statement is published a cut showing 11 vessels moored in a row, with bows pointing toward the camera, beneath which is the caption:

"These 3,500 and 4,000-ton wooden ships of the Emergency Fleet Corporation are part of the 50 which lie idle in the harbors of the Pacific coast. The green timbers used in their construction are said to have shrunk on their maiden voyages, making them totally unseaworthy."

Of the 11 pictured, only four are shown to have smokestacks or funnels, so they might have made voyages, but the others are hulls only, and it is not recited how they managed to propel themselves.

At the rate the shipping board has been selling the wood vessels, also their proven desirability for carrying lumber and ties from the Pacific to the Atlantic and Europe, while there are none of the steamers remaining at the yards which are not actually being finished for sea, the publication in question is causing a stir. While recognizing the harmful effect on the wood-ship industry, builders say the wood fleet has proved its stability so thoroughly that men interested in that class of construction know how far from the truth the Popular Mechanics story is.—The Morning Oregonian, Portland, Ore., June 25, 1919.

IN Lake Union, in the heart of Seattle, lie 44 wooden steamships, property of the Emergency Fleet Corporation's wood-ship division. In the East Waterway of Seattle's salt-water harbor are two more wooden steamers on the mud flats. Thus, a total of 46 wooden vessels of 3,500 to 4,000 dead-weight tons capacity, which cost around $200 a ton to build, lie in the harbor reaches of Seattle, representing, say mariners, nearly the total of the wood-shipbuilding program of the Pacific Northwest. These ships are on the bargain counter. Most of them have been lying in the "boneyard" for months, despite the fact that cargo carriers are scarce, which fact is an indictment of the green-wood shipbuilding program, it is said. Being built of unseasoned timber, green as the trees it was cut from and generally stored in water till used, the inevitable result was that as soon as a ship was launched its timbers began to shrink, its calking loosened, and it became unseaworthy.

These forty-six vessels represent a total of approximately 162,000 dead-weight tons, and a building cost of about $32,400,000. The subscriptions of the manufacturing cities of Seattle, Tacoma, and Spokane to the Victory loan amounted to $28,671,100. Thus, the fleet of idle vessels absorbed nearly $4,000,000 over and above all the money raised in the three large industrial cities of the state of Washington in that great bond drive.



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This Shows the Wooden Ships Anchored in Lake Union, Seattle's Inland Harbor. There Are 44 of Them in This Group. Their Open Seams may be Discerned at a Distance, and Paint Remains Only Here and There

### Identity of the Ships

The idle wooden ships in Lake Union are the steamers "Fort Jackson," "Allenhurst," "Boulton," "Boughton," "Bowesmont," "Bourneville," "Addison," "Ahmik," "Cineas," "Fort Union," "Chesterfield," "Puyallup," "Capraria," "Abilla," "Elestra," "Azalea," "Adria," "Abydos," "Oelwin," "Arcademia," "Academia," "Pezuta," "Black Wolf," "Birkland," "Agylla," "Bastine," "Blanford," "Agron," "Anthon," "Bertrand," "Bingamon," "Cabacan," "Cardia," "Cineyras," "Cozian," "Dione," "Elissa," "Endymion," "Fort Harrison," "Fort Stanwix," "Imukfa," "Kitan," "Looti," and the barge "Corus."

The two wooden steamers in the East Waterway are the "Babinda" and the "Berringa." From the last two the machinery was salvaged to keep them from sinking, and at present they are resting on the tide flat so they cannot sink. Their paint has peeled off from stem to stern and from keel to bulwarks. Their scabby appearance makes them an eyesore at a distance of several hundred yards; their open seams can be detected as far away, and the loose calking hangs in shreds from the gaping planks. These steamers show greater decrepitude because they have made an ocean voyage.

The 46 ships moored in Seattle's harbor represent part of the price the American people paid for having their war program in incompetent hands, say observers. The Emergency Fleet Corporation, despite reckless expenditures aggregating millions on the wood-shipbuilding program, acted honestly, but with a blind faith which led it into a pitiable failure in this branch of its endeavor.

### Fallacy of Green-Timber Construction

Builders from the great British shipyards on the Clyde and from the famous yards of New England tell how timber is prepared for shipbuilding. Months, perhaps even a year or two, are spent in carefully curing every stick of wood before it is slung up on the shipways and made a part of a vessel. A ship constructor who is a conscientious builder, they say, would no more think of putting a green plank or beam in a ship than he would of condemning his sailor brother to make an ocean voyage in a cheesebox. But on the Pacific coast fir logs were towed to the mills in booms, taken up on the conveyors, roughly cut, and immediately dumped back into the water to be towed to the shipyards. There also, to

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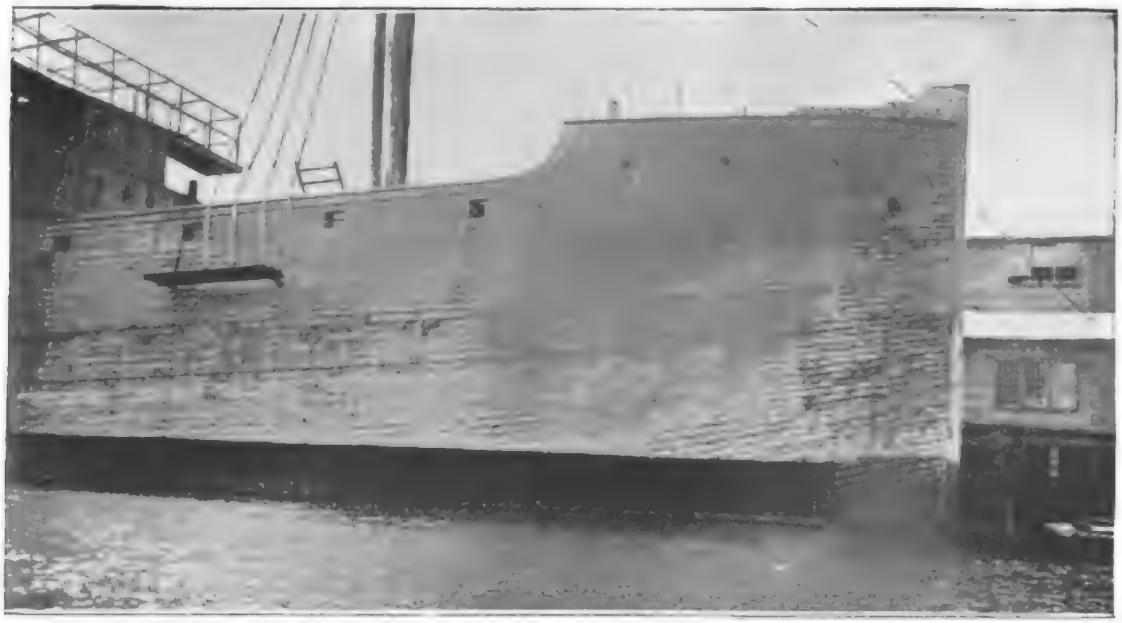

Close-Up of the Bow of the "Berringa" Taken from a Sandspit: The Gaping Seams of the Ship Are Plainly Visible, and from Them the Calking Hangs in Shreds. The Picture Also Illustrates the Action of the Green Timbers on the Paint, Which has Scaled Off from Stem to Stern and from Keel to Bulwarks

facilitate storage, the timbers were generally kept in booms in the water until picked up by the gantry cranes and slapped into place on the building ways. In a few weeks the hull of a ship was ready for launching. It was inspected—for knotholes—slipped into the water, and the builder credited with another ship.

It was a smooth chain; the millman sold his best logs at a price he never before dreamed of, and could pay his crew good wages; the shipbuilder put on an army of extra workmen to rush the job, slapped the ship together, launched it, and with the credit allowed could pay his carpenters high wages and allow bonuses to every official, superintendent, foreman, and underforeman. Everything went serenely. Ships and more ships was the cry, and, about the time the armistice was signed, enough of these green wooden steamers had been launched and fitted out with machinery to put the wood-shipbuilding program to the real test of service. Then came the cruel awakening.

The "Babinda," Companion Hulk of the "Berringa," and a Wooden Steamer Which Suffered the Same Fate: Both These Ships, It is Understood, were Purchased by the Australian Government. The Derrick Used to Hoist the "Babinda's" Engines and Boilers Is Still in Place. The Condition of Her Timber and Seams, It can be Seen Even at a Distance, Is the Same as That of the "Berringa," and Her Paint Also has Scaled Off

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### The Program "Blows Up"

With flags flying and whistles tooting, the first few completed wooden steamers headed for the Atlantic via the Panama Canal. Somewhere off the coast of Oregon or northern California one of them evidently opened too many seams at once and entered the port of missing ships. Nothing has been heard of it or its crew since the day it sailed out of Puget Sound. One wooden steamer, it is stated, put in to San Francisco with its timbers so badly shrunk that the crew declared they could stand in the hold and see the city through the gaping seams.

Some of the wooden steamers reached France. There, it is said, as much money was spent to put them in shape again to go back to sea as it cost to build them originally.

The steel-shipbuilding program was going ahead under a full head of steam. The steel steamers met their tests and went into service without a hitch, as did the wooden steamers, but the steel vessels made voyage after voyage, circled the globe and returned again and again to America for cargoes. Today the steel ships, shipping records show, are giving close to 100-per-cent service. The wooden steamers, on the other hand, are, with but few exceptions, lying idle near the place where they were constructed. Being built of green timber, say mariners, they are not seaworthy; being unseaworthy, insurance cannot be obtained on them; without insurance to protect the shippers, none will charter them.

When the crash came, builders of wooden steamers saw their market collapse and sought to "get out from under." A suggestion was even made that hulls on the ways be paid for to the extent that they were completed, and then dynamited. Finally it was thought better to complete the shells and slip them from the ways so they could be towed to some safe harbor, while prayerful supplications were sent up that somebody would buy them—if only for barges.

The building of unseaworthy ships, however, was by no means confined to the West. The Atlantic coast can also furnish its examples.

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## THUMB PRINT PROTECTS AUTO FROM THIEVES

Professional automobile thieves may cease to reap their regular harvest and find real cause for worry in a system for protecting and recovering cars by means of thumb prints,

Thumb Prints for Protecting Automobiles: By Comparing the Print on a Car's Instrument Board with Those on Cards Filed with the Police and Carried by Drivers, the Ownership of a Machine can be Established, as a Description of the Owner is Written on the Cards

one of which is placed on the instrument board of the machine by a process that prevents its removal without noticeable defacement of the board. A card bearing a duplicate of the thumb mark is carried by the owner of the car, while other cards of a similar nature are placed on file with the police.

## HIGHWAY-TRANSPORT COURSE INCLUDES MANY SUBJECTS

College courses in highway-transport engineering, a profession that is growing out of the increased use of the motor truck, must include a large number of diversified subjects, and give the graduate a much more comprehensive knowledge than is given by many technical courses, declares an eastern university professor. Economics, political economy, social science, business and contract law, scientific management, business organization, cost accounting, interstate commerce, and marketing and distributing systems should be included in the course as basic subjects, according to this authority. Other subjects to be studied include highway-traffic legislation; highway-transportation methods; highway engineering as it affects economic highway transport; the mechanism of the motor truck, motor bus, tractor, and trailer, and their operation, inspection, maintenance, repairs, and cost data. With such preparation, every phase of road traffic could be handled.

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# REMODEL ARMORY WEAKENED BY SETTLEMENT

Strongly reinforced concrete floors held together the walls of a big armory in a Middle West city for years after the structure was weakened by settlement, but recently it was found expedient to remove a considerable portion of the building from its sinking foundation and to brace the remainder to make it safe for occupancy. Before this scheme was carried out, several plans for restoring the armory were considered and a few tested. One attempt was made to level the structure with jacks, but it was a failure. The front of the original building was three stories high and of stone construction. Back of this was a drill hall, the roof of which was supported by six arched steel trusses. On one side of these structures was a rifle range, and on the other a riding hall, both one story in height.

The Original Armory: Indicated by the Arrow, Is the Line above Which the Stone was Removed to Make the Building Safe. Reinforced-Concrete Floors Held the Walls Together for Years

View of the Remodeled Structure: The Wall in the Foreground, Formerly the Base of the Main Building, Shows How the Latter Settled at Its Right End. Back of the Wall Is the Front of the Drill Hall

In carrying out the latest project, the second and third stories of the main building were taken off, leaving the base standing as a stone wall some distance in front of the drill hall. The ground floor was left, as it binds together the entire structure, and the front wall of the drill hall, then exposed, was improved in appearance with stucco and other material. Four longitudinal struts were placed in the roof of the drill hall, connecting the trusses, while diagonal braces were installed between the steel columns supporting the latter. As they had settled only a little, the rifle range and riding hall were not altered.

Investigation of the site on which the armory was built disclosed that the subsoil is soft mud for 41 ft. below the surface at many points. Piles driven to provide a foundation for the building were not long enough to reach a solid stratum of earth. Settlement of the structure began while it was being erected, and continued until the heavy upper portion of the main building was removed. At certain points it sank over 2 ft. Engineers differ on the question of whether the armory in its present condition is safe.

## DEVICE PREVENTS OXIDATION OF MOLTEN ALLOYS

Oxidation of molten alloys, and consequent loss of material, is prevented by a simple device recently patented in Germany, it is declared by the inventor. An air-tight container is provided for holding the combined metals while heat is applied, and to this is attached a pipe which connects with a cylinder filled with compressed nitrogen. The introduction of this inert gas into the melting pot prevents oxidation. A valve is provided to control the flow of nitrogen.

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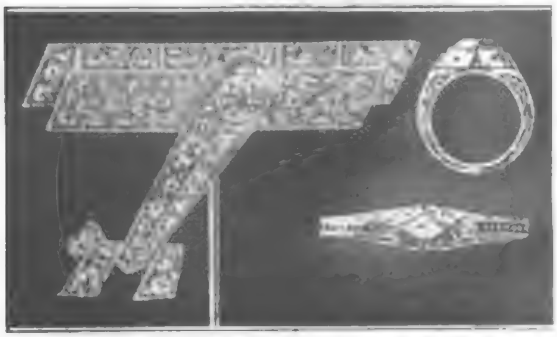
## PRESENT CHAMPION AIRMAN WITH VALUABLE JEWELRY

Exquisite tokens of gratitude and admiration were presented recently by two west-coast cities to the American airman



These Creations of Platinum and Diamonds were Presented by Two West-Coast Cities to America's Champion War Flier

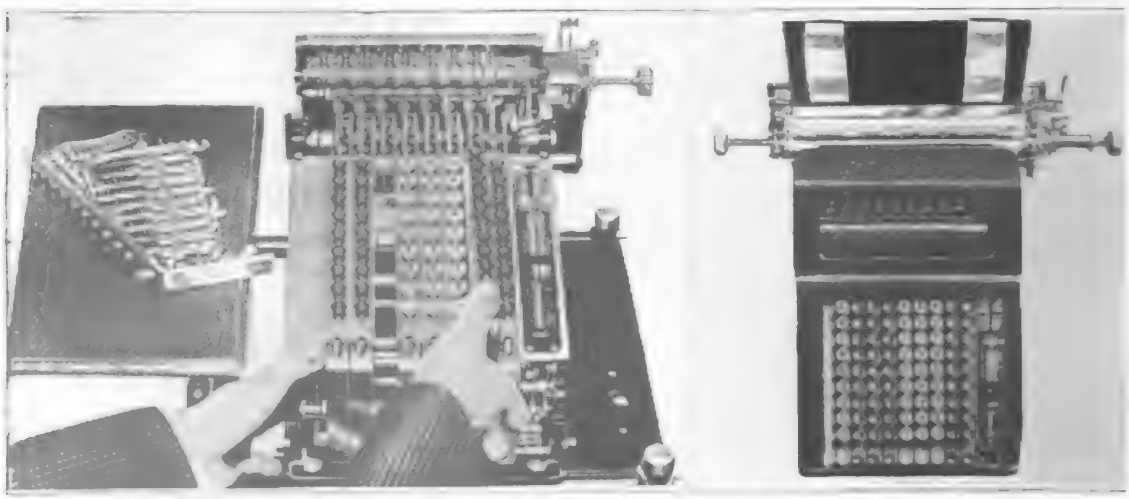
whose war victories outnumbered those of any other member of the air service. One is a scarf pin of platinum, bearing a miniature biplane, which is studded with 48 diamonds, representing the states of the union. This is valued at $1,000, and was given to the flier at a banquet arranged in his honor. Another city bestowed on the hero a platinum ring, set with a one-carat, diamond-shaped diamond. The stone is surrounded by enameled representations of the four aces in a deck of playing cards. On one side of the setting is the insigne of the air service, while on the other is the seal of the municipality which gave the ring. Encircling the band are 26 stars, in relief, representing the recipient's victories. Both pieces of jewelry were designed and made in the cities presenting them.

## ELECTRICAL PRECIPITATION SAVES LOST SILVER

A concern engaged in melting silver saved $30,000 worth of metal in one year by installing an electrical precipitation plant costing $25,000. The amount of vaporized metal collected corresponded exactly with the advance calculations, made by the use of available tables on the so-called vapor tension of metallic silver. It was found that a considerable quantity of the silver was vaporized even at temperatures lower than the melting point, where an open flame was in contact with the metal. The quantity increases, of course, as the temperature rises.

## ADDING MACHINE SUBTRACTS AND MAY BE TAKEN APART

At least two novel features are embodied in the construction of an adding machine just placed on the market by an Iowa concern. Most remarkable, perhaps, is the facility and safety with which it may be taken apart, in spite of its complex nature, a pair of pliers and a penknife being the only tools necessary. The sectional-unit construction of the keyboard makes it possible, by withdrawing a rod, to remove a defective row of characters, substitute temporarily one taken from a less used part of the machine, and continue the work in hand. The adding wheels are removable in like manner. The operation of greatest value, however, is the machine's ability to subtract as easily as it adds. This is made possible by a simple reversing lever, which causes the adding wheels to run backward.



The Manner in Which the New Adding Machine is Taken Apart, and Its Sectional-Unit Construction, are Plainly Seen at the Left. The Assembled Machine is Seen at the Right, the "Subtract" Lever Being Visible at Its Lower Right-Hand Corner

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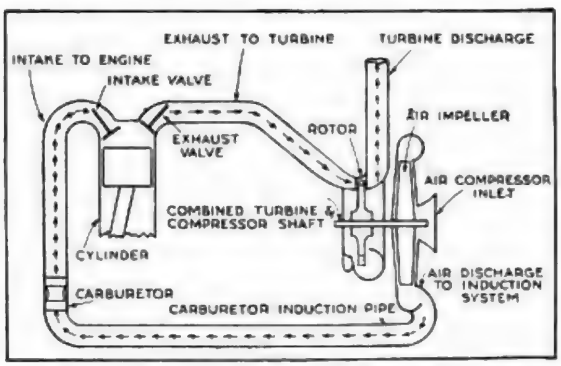
Airplane with Supercharger Installed on Its Liberty Motor: It Feeds Air to the Carburetor at Constant Pressure Regardless of Altitude, the Speed of the Turbine Rotor and Air Compressor being Automatically Changed as the Height Changes, The Turbine's Maximum Speed Is 31,050 Revolutions a Minute

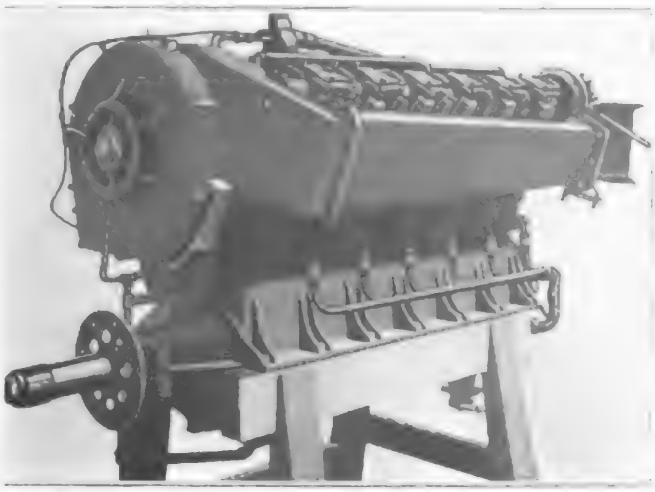
# ENGINE SUPERCHARGER MADE RECORD FLIGHT POSSIBLE

FOR four or five years European aeronautical engineers have been experimenting with mechanisms which would maintain constant air pressure before the carburetors of air-craft engines regardless of altitude. They have known that the air-craft engine delivers at 20,000 ft. only 50 per cent of its ground-level power; they have searched, consequently, for a compact air compressor of small weight, which will maintain the normal power of an engine at all reasonable altitudes. The work in America, begun several years later, has heretofore been purely experimental; but with the recent performance of Major Shroeder's Le Pere biplane at Dayton, Ohio, the "supercharger," or auxiliary compressor, seems to have come to stay. The major climbed to 18,400 ft., and at that height, with the aid of a supercharger, was able to fly at the remarkable speed of 137 miles an hour.




The Diagram Shows the Course of the Air from the Compressor to the Carburetor, and of the Exhaust Gases from Cylinders to the Rotor of the Turbine

The plane was driven by a 12-cylinder Liberty motor equipped with a Moss supercharger. The Moss, like the Sherbondy apparatus, is an American adaptation of a French invention, which it closely resembles in general operation. The red-hot exhaust gases from all cylinders are piped through special manifolds to the nozzle box of a small turbine, which is delicately balanced to allow a maximum speed of 31,050 r.p.m., and is made of a special alloy to withstand the terrific heat. A small, automatic control mechanism adjusts the turbine speed as the airplane changes altitude. Mounted on the same shaft as the turbine, but separated from



The Supercharger is Here Installed on the Front End of a 12-Cylinder Liberty Motor, the Turbine Nozzle Box Being Large to Avoid Restricting the Exhaust Gases



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it by a cooling air or water space, revolves the centrifugal air compressor. From the compressor an air-tight induction pipe leads the air, now at approximately 15-lb. pressure, to the carburetor or carburetors. The whole apparatus is cleverly fitted into the smallest possible compass, permitting its installation at the front of the engine, just behind the propeller.

Such, in a general way, is the operation of the Rateau (French), Moss, and Sherbondy superchargers. Consuming only five to ten per cent of the engine's delivered horsepower, the supercharger adds 40 per cent at 15,000 ft. and 50 per cent at 20,000 ft. The gain in power is thus seen to be tremendous, easily compensating for increased weight (between 200 and 300 lb.) and complications of design and operation. Equipped with a supercharger, the fast plane of tomorrow will shoot along, four miles above the earth, at 200 miles an hour. Airplanes will travel faster at high altitudes, not slower, as at present.

## HANDLESS TYPIST EMPLOYS SIMPLE CONTRIVANCE

Though both of her hands are missing, a young woman of St. Louis operates a typewriter with considerable speed

Handless Girl Operating Typewriter with Cushioned Stick Attached to Artificial Hand: The Device is Shown in the Insert

and dexterity. Following an accident four years ago, the victim's right arm was amputated just below the shoulder, while the left was taken off midway between the elbow and wrist. Since then she has worn papier-mâché arms and hands. The contrivance used for manipulating a typewriter is a round stick of wood, slightly over seven inches long, to which is attached a brass ring near one end and a rubber tip at the other. One of the fingers of the artificial left hand is passed through the ring when the device is employed, and the handless typist strikes the keys with the cushioned end.

## UNLIMITED STREET-CAR RIDES FOR ONE DOLLAR A WEEK

A remarkable experiment in flat-rate street-car service is being tried in the city of Racine, Wis., having gone into operation on August 18. The system is the simplest possible. For one dollar the passenger buys a pass, good for one week, which gives him, and other members of his family, the privilege of unlimited riding. Conductors do not punch the cards, nor ask identification of the holder, and of course no transfers are needed. The week's cards expire at midnight on Sunday, each issue being distinguished by a different color. Obviously, the company hopes to raise the average transportation expenditure of its patrons by this bold means. Other public utilities with pronounced views on the unlimited-service question will watch the working of the plan with extreme interest.

## CONCRETE-ROAD CONSTRUCTION FACILITATED BY HUGE ROLLER

Apropos of the stress now laid on road construction as a factor in national prosperity, it is interesting to note the invention and use of a gigantic steel roller, weighing a ton alone, which extends from one side of the roadway to the other. Following close upon the mixer, the mass of steel is moved by two or three men back and forth over each 25-ft. section. Due to the weight and concave profile of the roller, this operation, repeated three or four times, is sufficient

Rolled Back and Forth over the Newly Laid Concrete Roadway, This Huge Steel Roller Gives It Just the Desired Consistency and Convexity of Surface

to compress a 5-in. roadbed to the proper consistency, giving it at the same time exactly the desired convexity of surface.

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# STEAMER SLIDES INTO WATER READY FOR VOYAGE

A New Chapter was Written in the History of Shipbuilding Recently When the Steamer "Lake Fugard" was Launched at Buffalo, New York, Fully Equipped for a Voyage, with Engines Installed, and Steam in the Boilers. The Vessel is Shown Here on Its Ways

Striking the Water at the Dangerous Angle of 70 Degrees with a Mighty Splash after a Drop of 23 Feet from the Ways, the Ship Already had Righted Itself Somewhat by the Rebound of Water When This Picture was Taken. Ordinarily, an Inclination of 60 Degrees Is Disastrous

Ready to Sail: The "Lake Fugard" is Pictured as It Appeared Just after the Extraordinary Launching, Resting in the Slip into Which It Plunged When Released from the Ways. At the Left can be Seen the Scaffolding Used by the Builders of the Craft



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# GLASS-WALLED THEATER ON BUILDING ROOF

At Night the New Glass Theater, Building, Makes Quite a Spectacle Going and Its Transparent Walls

With the Big Glass Panes Swung Open, the House Is as Cool as Outdoors

Away Up on the Roof of a Seven-Story from the Street, with All Its Lights Glowing with the Radiance Within

A theater with walls of glass, seating a thousand spectators seven stories above the pavement, is Cincinnati's latest offering to entertainment. Wire-glass panels, set in huge steel frames, compose not only the sides but most of the roof of the curious structure, which will cost about $30,000. The seven-story building on which the new auditorium rests is itself a theater, and during fair summer weather its roof has been used without covering for such entertainment as suited the location. Now it will be possible to enjoy the outdoor effect the whole year. When it is hot, the big glass panels may be swung outward, and even the roof thrown open to admit the breezes. With this new roof garden, the whole theater building will seat a total of 3,100 persons.

# PASSENGER TRAIN CROSSES UNSTABLE TRESTLE

Passengers on a railroad train in western Canada spent a few anxious minutes recently when the coaches passed slowly over a long wooden trestle, which sank alarmingly and threatened to crumble. The structure was 150 ft. high and 500 ft. long. It had been buried in an embankment to give it stability, but when the thrilling incident occurred, earth covered only the bottom halves of the supporting timbers, which rested on soft ground. At one point the surface of the bridge was depressed 2 ft. by the heavy cars. The train was pushed over the trestle, it being thought inadvisable to run the ponderous locomotive across.

Passenger Train Crossing a Sinking Trestle: Anxious Travelers can be Seen Looking from the Windows of the Coaches as They are Pushed Slowly across the Unstable Structure. Had the Trestle Given Way Completely the Coaches Would have Plunged Downward 150 Feet

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## PROPOSE AUSTRALIAN STONE AS DIAMOND SUBSTITUTE

Diamonds are rivaled in brilliance by white zircons found in great abundance in Australia and elsewhere and proposed recently by a French jeweler as cheap but satisfactory substitutes for the more precious stones which they so closely resemble. This is considered timely because of the growing cost and scarcity of genuine diamonds. Carefully cut, the sparkling crystals deceive even experts, who are forced to examine them closely before detecting their true character. Another beautiful zircon is known as the Australian hyacinth. It is a blood-red stone, resembling the ruby. Several years ago these stones sold at the mines in Australia for as low as $14 a carat. One reason given for the advance in the price of diamonds is that a large quantity of the stones have been hoarded by a syndicate of German bankers who are holding them to obtain a larger profit by their sale. The seizure of these diamonds is urged by jewelers in other countries.

By Using the Telephone Transmitter of the Automobile Radio Set as a Telegraphic Sender, Ranges Up to 40 Miles Are Possible with the Portable Antenna

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¶ Five automobile speeders were recently sentenced by a Chicago judge to a trip through the morgue and the county hospital, to gaze upon the victims of other speeders and report their impressions to the court later. This, the judge declares, is to be a regular procedure in the speeders' court hereafter. Effects upon the first offenders so punished appeared satisfactory.

## RADIO SETS FOR AUTOMOBILES PROMISE OF NEAR FUTURE

It is becoming quite apparent that practical and useful radio equipment for automobiles is not far away. Experimenters have been working with the problem for years, with some measure of success, but generally embarrassed by the awkwardness of the necessary antenna. In a set of recent design, which talks 15 to 20 miles and telegraphs 40, the antenna masts, like miniature telephone poles, are carried on hooks under the running board, and only installed, at front and rear of the car, when emergency demands their use. The talking equipment, of the latest vacuum-tube type, has been reduced to a practical degree of compactness.

All the Radio Equipment is Carried, without Crowding, in Odd Corners of the Automobile, the Antenna Masts and Wires being Folded under the Running Board When Not in Use

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## MAKE INSULATING MATERIAL FROM FIBROUS SEAWEED

An almost inexhaustible supply of fibrous material, suitable for the manufacture of steam-pipe and refrigerating-plant insulation, exists in the matted seaweed which grows on the bottom of the ocean near the southern shore of Australia. Several companies have been formed for transforming the vegetation into marketable products. There are 4,500,000 tons, dry weight, of the weeds available, it is estimated, and as the beds are covered by only a few feet of water, the gathering of the plants is an easy task.

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## FRENCH FLIER GLIDES UNDER FAMOUS PARISIAN ARCH

A French airman, Lieutenant Godefroy, recently performed the feat of flying through the famous Arc de Triomphe in

French Airplane being Piloted by Lieutenant Godefroy through the Great Triumphal Arch of Paris

Paris, after practicing with a wooden frame of the same size. The plane's wing spread was 24 ft., a little more than half the width of the arch opening, which is 69 ft. in length. The flier stopped his engine, glided through, and then continued his flight.

## POWERFUL ELECTRIC CURRENT FAILS TO KILL LINEMAN

Apparently dead for half an hour after his body had served as a conductor for a 7,000-volt current of electricity, a lineman in an eastern city recovered from the shock, climbed down from the pole on which he had been stricken, and resumed his work without medical attention. When the accident occurred, he was strapped near the top of the pole, splicing wires. After the current had been switched off, several men, using ladders, attempted to remove the seemingly lifeless body from the pole, but were unsuccessful. Suddenly the rigid muscles of the supposed corpse relaxed, and the lineman surprised the curious crowd which had assembled by extricating himself from the strap and descending.

¶A novel arc carbon of French invention consists of a solid rod inside a hollow cylinder, the space between being filled, if desired, with light-coloring substance. The arc formed at the end is rotated by a magnetic coil.

## ODD ELECTRIC LAMP GIVES NONACTINIC RAYS

An electrical lamp has been developed in Europe which virtually consists of a metallic arc inside of a sealed bulb containing attenuated helium and neon gases. The wire anode terminates so closely to the edge of the hemispherical iron cathode that the current discharges across the gap spontaneously. The rays have an orange hue and are only slightly actinic, making the lamp useful in photographic dark rooms. It is also recommended for use in mines, and other places where inflammable gases may be present, because breaking of the bulb instantly extinguishes the light.

## RESCUING OUTFITS PLACED ON SHORES OF LAGOONS

Along the shores of lagoons in a public park at Toronto, Canada, have been placed at regular intervals complete outfits for saving drowning persons or recovering the bodies of those who perish in the water. The outfits are hung on posts which bear signs calling attention to the contrivances, and giving instructions for their use. Each outfit includes a life buoy; a 16-ft. wooden pole, to the end of which are fastened three barbs, intended to be used in recovering bodies; a bottom drag, consisting of an iron bar to which are fastened numerous fishhooks and two ropes, and a ladder, 9 ft. long, equipped with hooks at one end so that it may be hung over the edge of a pier when necessary to effect a rescue.

One of the Complete Life-Saving Outfits Which Dot the Shores of Lagoons in a Public Park at Toronto, Canada. Signs on the Posts Bear Instructions

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# CAMP-BORN TANK PINES FOR LUSTY FARE

WANTED—Houses to wreck. If you want a house torn down free, apply to "ERMENTRUDE THE TANK," Pioneer Square.

THE above advertisement appeared recently in the Seattle newspapers. For life had become rather dull to "Ermentrude" after her exciting "Treat 'Em Rough" days in the Argonne and on the Meuse. "Ermentrude" sounds like the name of a perfectly parlor-broken young lady, but in this case it is a misnomer, for the youngster craves action and plenty of it.

Contractors erecting a new building in the down-town section of the city were confronted by the task of breaking up a concrete wall 16 ft. high, 83 ft. long, and 18 in. in thickness. The wall was estimated to weigh around 250,000 pounds. A fleet of heavy motor trucks had failed to pull the wall over. Breaking it up with hammer and drill would have been very costly. Finally the contractors hit upon the plan of giving "Ermentrude" a fling at it. She appeared upon the scene at noon and waddled into the excavation in charge of a crew of war veterans. Slowly she climbed a slight incline which separated her from the wall and, with a roar, butted the solid concrete. The wall shook slightly but did not succumb, although the doughty little hard-hitting tank made a scar three inches deep. "Ermentrude" backed away. A crowd of curious persons gathered and began to wager money on the contest. Again and again the tank assailed the wall. At twenty minutes past one, less than half an hour after "Ermentrude" appeared upon the scene, she brought it down with a crash, indifferently shaking off the half-ton chips of concrete that dropped upon her shoulders.

The Action has Started, and the Tank has Already Bumped Her Nose Once against the 18-Inch Thickness of Concrete

"Ermentrude the Tank" Appears on the Scene, Ready and Eager to Charge the Concrete Wall and "Treat It Rough"

The Wall has Surrendered, and Lies Broken before Its Conqueror, Which Is None the Worse for the Encounter or for the Shower of Concrete "Shrapnel"

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"Ermentrude" mounted her vanquished foe, cast a calm, victorious look about her, and, pointing her nose about, waddled out to the street amid the cheers of a mob of onlookers, and went away in search of more worthy prey.

## MACHINE LOADER HANDLES HAY IN BUNDLES OR LOOSE

A new loading machine, devised by a Minnesota inventor, handles hay and similar materials either loose or in bundles, with equal facility. A revolving drum with spikes like pitchfork tines, coöperating with a series of rake teeth, picks up the hay and throws it onto an inclined conveyor. Thus elevated to a deck or platform, it is transferred to another conveyor, at right angles to the first, which lifts it to the barn loft or into the body of a vehicle. Transverse slats on the inner side of the conveyor catch any loose grain that may escape from the bundles while they are being picked up or elevated, and return it to the deck.

The Revolving Pitchfork Drum at the Bottom can be Seen Here, as the Hay Loader, in the Lower Picture, Prepares to Move Up on the Haystack. How the Hay, Loose or in Bundles, Travels up the Conveyor to the Platform is Clearly Seen in the Upper View

## ELECTRIC ARC CUTS ROCK FOR TUNNELING WORK

Use of the electric arc for cutting rock in tunneling operations proved quite successful in recent experiments in California. The rock is chipped off by its own expansion, and requires an arc that is thrown forward from its electrodes like a flame. For this reason a three-phase current was used, creating a magnetic field that forced the arc forward. The electrodes were two-inch carbons, which could be contacted or separated two inches. With current of 450 amperes per phase at 40 volts, the rock was removed at the approximate rate of one pound a minute, and the cost figured out at about one-half cent a pound.

## SHIFTING ASPHALT IN LAKE BENDS BORING TOOLS

Attempts to sound the great asphalt lake on the Island of Trinidad are impeded by the almost imperceptible but irresistible shifting of the mass in the enormous reservoir, the boring tools being bent and their progress through the semisolid material halted. Recently a new low level of 150 ft. was reached, but the bottom was not found. In six weeks the record hole shifted 25 ft. on the surface, and it was discovered that the movement extended 100 ft. downward. There was a slight counter-movement between 25 and 50 ft. below the surface. Boring was done by driving a small pipe into the lake to the desired depth, withdrawing it with its core of asphalt, and then driving a 2-inch pipe in the same direction at the same location. A jet of water was used to remove material forced into the larger pipe.

¶When the Pacific fleet was 150 miles southwest of San Diego, Calif., a short time ago, a party of newspaper men were taken out by Capt. Lowell H. Smith in a De Haviland plane, and secured photographs of it. These the flier later took to San Francisco, between 9:22 a. m. and 5:45 in the afternoon.

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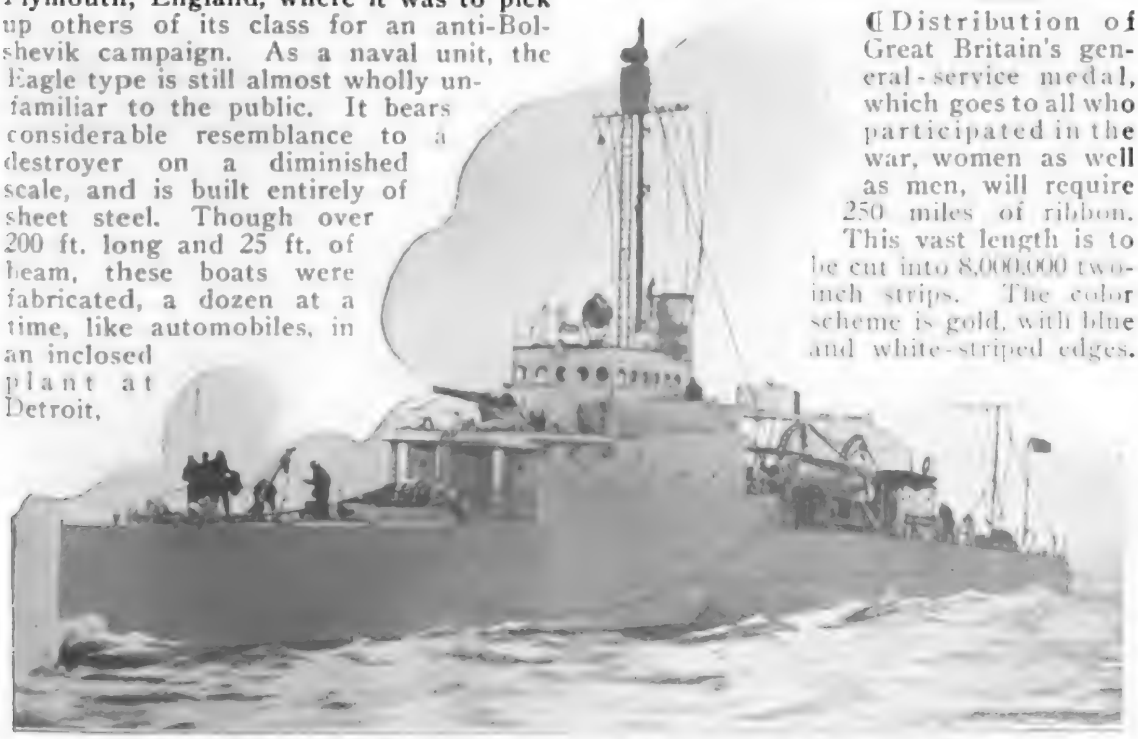
**DRESSING CONTEST FORMS PART OF HOSPITAL SPORT PROGRAM**

IN the great hospitals maintained by the United States government for the reconstruction of its wounded defenders every effort is made to encourage a healthy, cheerful morale, free from discouragement and gloom. For this purpose fresh air, sunshine, and competitive exercises have been found more beneficial than whole carloads of pills. Thus the illustration portrays one of the most hotly contested events in a recent field day, or athletic carnival, staged by the crippled veterans. Three contestants, each handicapped by the loss of a hand, are racing to see who can most quickly dress himself. That the performance is locally considered an interesting event is indicated by the large number of spectators, who watch the competition with close attention, while the referee gives the affair all the formality of a wrestling match for a championship. The contestants usually develop a surprising dexterity in a short time.

## EAGLE BOATS ON THEIR WAY TO ARCHANGEL, RUSSIA

A short time ago "Eagle" boat "No. 2" started for Archangel, Russia, by way of Plymouth, England, where it was to pick up others of its class for an anti-Bolshevik campaign. As a naval unit, the Eagle type is still almost wholly unfamiliar to the public. It bears considerable resemblance to a destroyer on a diminished scale, and is built entirely of sheet steel. Though over 200 ft. long and 25 ft. of beam, these boats were fabricated, a dozen at a time, like automobiles, in an inclosed plant at Detroit, Mich., the remarkable story of which was told in Popular Mechanics last September.

¶ Distribution of Great Britain's general-service medal, which goes to all who participated in the war, women as well as men, will require 250 miles of ribbon. This vast length is to be cut into 8,000,000 two-inch strips. The color scheme is gold, with blue and white-striped edges.



**"Eagle" Boat "No. 2" on Its Way to Archangel, Russia, via Plymouth, England: This Is One of the Best Photographs Yet Taken of the New Type of Naval Unit, Which Is Over 200 Feet Long, Made of Sheet Steel, and Built, a Dozen at a Time, in a Detroit Factory**

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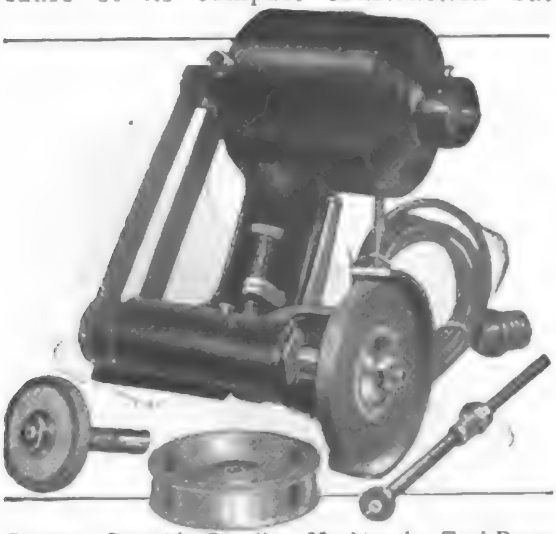
## PORTABLE GRINDER DOES WORK OF LARGE FIXED MACHINE

A portable grinding machine, small because of its compact construction but able to take care of all the work of tool room or machine shop, is now offered by a Wisconsin manufacturer. The electric driving motor, of ⅛ to ½ hp., is immediately above the spindle and out of the operator's way. The grinding wheels are interchangeable, and for interior grinding an adjustable shaft is fitted into the ferrule of the spindle, which has a 5/16-in. opening. In use the grinding wheel is moved over the work, instead of the usual reverse process.



Compact, Portable Grinding Machine for Tool-Room and Machine-Shop Use: The Spindle Is Hollow to Take the Shaft of the Internal Grinder at the Right

## GOVERNMENT BUILDS EASTERN TERMINAL FOR AERIAL MAIL

The usual difficulties were encountered in finding a suitable location for the eastern terminal of the aerial mail. Some fields were rejected because too small, others because poorly located. The site finally acquired was not in New York, as might have been expected, but in the northern part of Newark, N. J. Even here, however, weeks had to be spent in dynamiting stumps, grading and leveling, before the surface could be used. While this work was going on, plane and hangar parts were collected on the ground. Airplane mail received at the field is rushed by automobile to New York City, nine miles away.

The Boxes of Airplane Parts, Engines, and Other Paraphernalia Were on the Field Almost Before It was Cleared, and in the Background may be Seen the Felled Trees and Blown-Up Stumps of the Clearing, Ready for Removal

Steel Roof Trusses, and Other Hangar Parts, Are Ready for Assembling. Work That can be Done While the Final Stumpage and Brush are Cleared from the New Eastern Terminal Landing Field for the Aerial Mail Service

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# TUG SUNK NINE YEARS AGO SALVAGED BY LIGHTER

The Boiler, Detached from the Sunken Hull of the Tug, was Brought to the Surface First, Reducing the Vessel's Weight

Funnel of the Long-Submerged Boat as It Appeared When Emerging from the Waters of Mud Lake

This Picture Shows the Steel Cable Slings Which were Used to Lift the Long-Submerged Wreck from Its Muddy Resting Place

**Resurrecting the Steam Tug "General": Powerful Steel Cranes on a Huge Lighter were Employed. The Illustration Depicts the Hull as It Looked Just after It Rose from the Water. It was Pumped Out, Patched, and is being Repaired**

Buried in silt at the bottom of Mud Lake, near Detour, Mich., for nearly nine years, the steam tug "General" was salvaged recently, and soon will be in service again. The boat sank in 55 ft. of water in 1910, after a collision with a steamer, and settled on its side until the port rail was level with the bottom of the lake. A large lighter, equipped with two steel cranes, was moored over the submerged craft. It was a comparatively easy matter to recover the boiler, which was raised by one of the cranes after it had been disconnected from the hull. Salvaging the hull was more difficult. Three holes were dug in the mud on each side of the wreck, and into these were directed streams of water under high pressure. By this means tunnels were bored under the ship. Steel cables were passed through the tunnels, and formed into slings, which were attached to the cranes. When the tug was within 12 ft. of the surface, the lighter and its burden were towed five miles out in the lake to clearer water, where the boat was further elevated, pumped out, patched, and floated. The vessel was then taken to a harbor, and the work of repairing it was begun.

## FARM IMPLEMENTS DAMAGED BY LACK OF SHELTER

Damage done to farm machinery through exposure amounts to $1,000,000 annually, according to an estimate made by experts at the Agricultural College of the University of Wisconsin. It is pointed out that most farm implements are not used more than three or four weeks out of the year, and that in many instances they are allowed to stand without shelter during the remainder of the 12 months. Figures have been compiled to show that a shed costing $400 will pay interest on the investment at the rate of 22 per cent when housing $1,000 worth of equipment.

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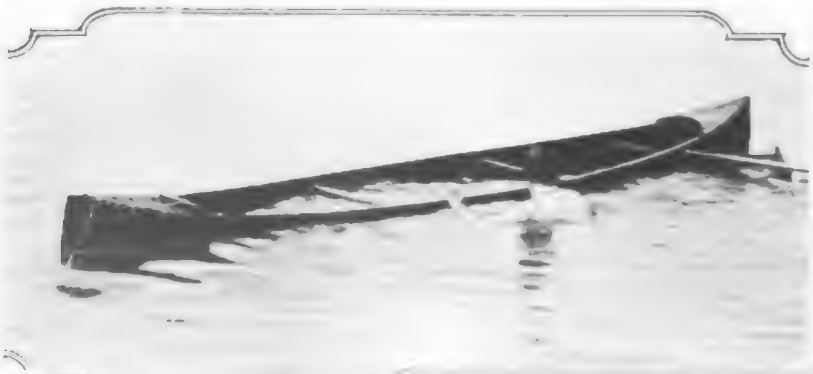
# CANOEISTS SHOULD KNOW HOW TO RIGHT A SPILL



When a Canoe, Capsized in Deep Water, has been Righted, It is Naturally Waterlogged. It can be Emptied by Lifting the Near Side as High as Possible, and Then Suddenly and Quickly Bearing Down upon It

This Throws Some of the Water Out over the Canoeist, Who Is Already Wet and does Not Mind More Drenching. The Operation must be Repeated a Number of Times, But in the End It will Eliminate Most of the Water

The Next Step Is to Climb into the Skittish Craft. This Should Always be Done over the End, and Never over the Side, as the Latter Way will Surely Cause Another Spill, and the Canoeist may be Caught Underneath

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# AS WELL AS THE WAY TO KEEP FROM HAVING ONE

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**Changing Seats Is** the Action Responsible for Many Canoe Accidents. The Only Really Safe Way to Do It Is for One Canoeist to Pass beneath the Other, Thus Keeping Perfect Sidewise Balance

A Canoeist should Not Stand Up, but if He Must, the Only Safe Place to Do It Is in the Exact Center of the Canoe

When He Starts He Assumes the Position He Feels the Greatest Material of Doing It—Along the Center Line, with a Hand on Each Gunwale

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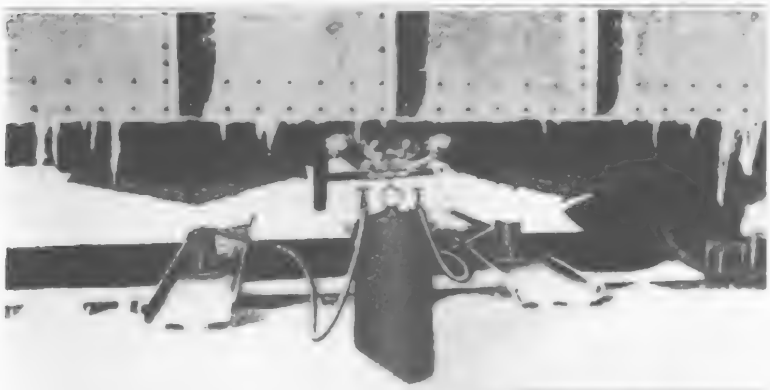
## PORTABLE OIL BURNERS THAW COAL FROZEN IN CARS

Not only is the freezing of coal in railway cars a frequent occurrence, but removing the solidified mass is the hardest kind of labor. A portable thawing outfit can now be obtained which is placed directly under the car hoppers. It burns kerosene oil, contained in a 10-gal. steel tank equipped with a powerful air pump. A pressure gauge, safety valve, and oil-regulating valves are also fitted to the tank. Two large burners are used, strongly constructed for hard service, and consuming 2 to 5 gal. of oil an hour. Connection with the tank is made by oil-proof hose. The outfit works rapidly, and in one instance thawed a completely frozen car of pea coal in less than two hours.



Kerosene-Burning Heaters Applied to the Bottoms of Freight-Car Hoppers to Loosen Frozen Coal So That It can be Unloaded

Near View of Thawing Apparatus, Showing the Oil Tank and Two Burners, with the Hoses Which Connect Them: On Top of the Tank Is the Handle of the Air Pump

## MOTORWOMEN OPERATE CARS IN SOUTHWESTERN CITY

Experiments with women as street-car employes have resulted in adverse decisions in a number of cities. An exception is Albuquerque, N. M., where motorwomen are a common sight on the local transportation lines. One reason for this lies in the fact that a large part of the population consists of families in which some member is a sufferer from tuberculosis, brought to the southwestern city to be benefited by the climate. In many instances the women of these families are forced to take the part of breadwinners for afflicted relatives.

The company which operates the street cars has established a school in which motorwomen are educated for their positions. After a few hours of oral instruction, a student is placed on a car and given charge of a controlling lever, while a teacher stands beside her to correct her mistakes and to guard against accidents. In about 10 days a beginner is allowed to take entire charge of a car. Khaki uniforms, consisting of a short skirt, a loose blouse, and a cap, are worn by the female employes. Wages are paid on a sliding scale, 90 days of service being required to obtain the maximum pay.

## UNDERGROUND TEMPLE FORMS MUSEUM ENTRANCE

The directors of a western museum are spending $40,000 to provide a unique subway entrance to the building, now almost inaccessible because of its position on a sharp rise of ground. Workmen are tunneling into the precipitous hillside below the museum, while others sink an 80-ft. elevator shaft to meet the tunnel. This improvement will in itself make the museum a curiosity; yet, in addition, the tunnel is to be made a picturesque memorial to a strange Indian race, dominant in many parts of Mexico at the time of the Spanish conquest. The portal and sides of the arch-roofed subway will be covered with inscriptions and lined with statues and pilasters, all facsimiles of originals found in the ancient temples of the Mayas. Soft lights will shine on fierce old Maya gods and tangled hieroglyphics. More than 200 ft. within the hillside, at the end of the horizontal passage, will open the large room in which visitors will wait for the elevator. In

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Tunnel Entrance to the Southwest Museum, Los Angeles, California: This View Shows the Mouth of the Subterranean Passageway, and Indicates Its Distance from the Building. On the Right Is a Picture Taken from the Inside of the Bore

strange contrast to its utilitarian purpose, the vault will be fitted as an exact replica of the weird, colorful Temple of the Sun in Yucatan.

## RIVET-HEAD CATCHER INSURES SAFETY FROM FLYING METAL

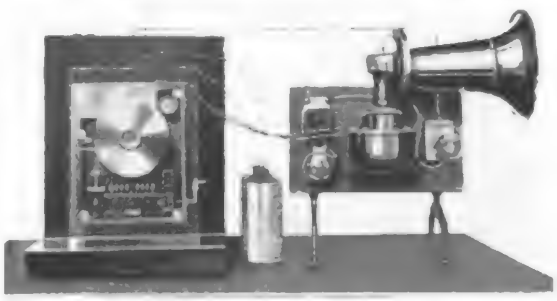
Cutting rivets, either by machine or with chisel and hammer, is attended by considerable danger. The severed heads are propelled away from the work with sufficient force to cause painful injury, even at some distance. A new safety attachment is a sleeve that fits over the shank of the cutting tool, with a hollow at the end that incases the rivet head.

The Sleeve That Incloses the Rivet-Cutting Tool Prevents the Severed Head from Flying Away, and Perhaps Injuring a Workman

When the latter is cut loose, it drops safely and harmlessly into the pocket formed by the hollow.

## ELECTRIC HORN'S CODED CALLS SUMMON DISTANT MEN

To locate, at the time he is wanted, any particular individual in the vast ramification of a modern coal mine, is a task of some magnitude. A signaling method which has lately come into successful use employs an electric motor-driven horn of the type installed on automobiles, but much larger. The motor, wound for the voltage of the mine's power supply, is connected to a coding switch run by clockwork, and each individual likely to be wanted is assigned a code call. When the operator turns a dial to the corresponding number, the call is sounded to all parts of the mine, and the wanted man responds at the nearest telephone. A signal bell and pilot lamp are mounted with the horn, for less-distant signaling.



Coding Switch, Run by Clockwork, and Dial with Code Numbers Are in the Case at the Left, Connected to the Big Motor-Driven Horn at the Right

◖King Albert of Belgium has purchased 15 seaplanes of various types, with which he will inaugurate an experimental service in the Congo.

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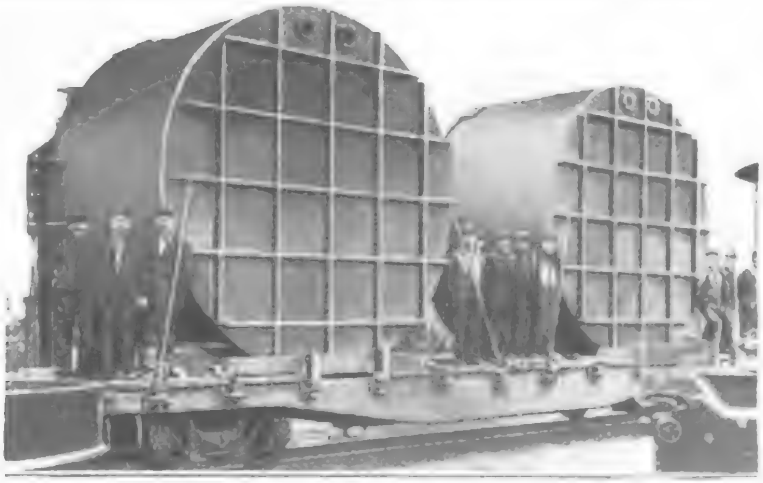
## IRON VATS DECLARED LARGEST EVER SHIPPED BY RAIL

A pair of cast-iron vats, each weighing 21 tons and 14 ft. in diameter, were recently produced by a foundry at Buffalo, N. Y., to be used as dissolving tanks in a chemical plant at Perryville, Md. Of several possible routes to their destination, only one could offer sufficient bridge clearance to pass the big tanks, which were propped up on edge on a heavy flat car. They are stated to be the largest tanks ever shipped by rail.



Only One Railroad Had Sufficient Bridge Clearance to Pass These Big Cast-Iron Tanks, Which, Mounted on a Flat Car as Shown, Stood 14 Feet above Its Deck

## NEW SEAMLESS METAL BOAT COSTS LESS THAN WOOD

A new method of manufacturing metal boats, which originated in England and has been patented in that country, in America, and on the continent, promises to make possible the production of small craft at a cost lower than that of wooden boats before the war. The new boats are seamless, and may be made of any of the coated sheet steels, or other metals suitable for marine work. For a plant of ordinary size, the production is calculated to equal one boat per day per man. Lifeboats, flying-boat hulls, and seaplane pontoons are within the scope of this method of construction.

¶ Rust-proof metallic coatings for iron and steel are discussed at length in a circular issued not long ago by the Bureau of Standards, and certain materials and coating methods are recommended for various purposes.

## PEACE TREATY HAS INTEREST FOR AMERICAN INVENTORS

American inventors would do well to familiarize themselves with Section 7, Part 10, of the Peace Treaty, entitled "Industrial Property." Among other things this section provides that patents held by citizens of allied countries at the beginning of the war shall be restored to the original owners as from the coming into force of the treaty. A grace of one year after that event will be granted for the payment of dues, etc., on patents acquired before Aug. 1, 1914, or which, except for the war, might have been acquired since that date. Other paragraphs consider allied use of German patents, failure to work patents during the war, and steps necessary for the prosecution of applications pending since the beginning of the conflict.

## FREE HOT WATER SUPPLIED IN CANADIAN PARK

Hot drinks can be served at picnics in a recreation park at Toronto, Canada, without the troublesome operation usually necessary to obtain boiling water in such places. This is made possible by a convenience placed on the grounds by the city authorities in the form of a gas water heater, which delivers hot water in any quantity through a faucet to all who care, and have occasion, to use it. No charge is made for the service. A wooden shed houses the heater, and a sign on the building calls attention to the fact that hot water is free. The cost of operating the device has been found to be small, but it adds greatly to the pleasure of the park visitors.

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# TONS OF GUNCOTTON IN SPECTACULAR FIRE

The Most Spectacular as Well as the Most Dangerous Fire in the City's History Almost Wholly Destroyed a Big Chemical-Manufacturing Plant in Newark, New Jersey, the Last Day of July. Huge Containers Full of Guncotton Exploded with Blast after Blast as the Flames Got under Way, and Other Chemicals in Barrels and Vats Joined In

The Fire, Which Started in the Lacquer Room, Consumed $100,000 Worth of Property Before It was Checked. The Dense Chemical Smoke, Rolling Up from the Smoldering and Blazing Mass, Formed a Column Miles in Length, and the Flames That Shot through the Haze Reached Hundreds of Feet into the A...

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## TIGHTENERS FOR FENCE WIRES BUILT INTO CORNER POST

A corner post of heavy concrete, with wire tighteners built right into it, is an improved arrangement for keeping long wire fences tuned up and preventing sagging. Each wire goes through a hole in the post and terminates in a little drum with a ratchet, by means of which the farmer can tighten them up with a crank in a hurry.

Each Fence Wire Goes through the Concrete Corner Post and is Wound on a Little Drum, Which is Tightened with a Crank

## FISH-CLEANING FAUCETS HELD OUT OF WAY WHEN NOT IN USE

In the crowded plant of a great seafood company has been installed a simple fish-washing arrangement which effects a remarkable saving in floor space. Consisting of a rectangular frame of water piping to which are attached eight faucets with as many short lengths of hose, the apparatus is held close to the ceiling when not in use. But when a boat delivers a cargo of fish, the frame is lowered to operating position, so that each of the eight workmen has his own faucet. They are thus able to wash the blood from the fish as fast as they come from the cleaners who have slit them open and removed the entrails.

## SOLDIERS ENTITLED TO PAY FOR ARMY INVENTIONS

Soldiers who invent devices for the betterment of the military service should receive the pecuniary benefits which accrue through the adoption of their inventions. This was announced recently when it was disclosed by the War Department that contractors, in some cases, have patented the ideas of army men in their own names, incorporated them in supplies sold to the government, and collected royalties that legally belonged to the originators. Soldiers whose inventions have been appropriated in this manner are advised by the department to file suit in the Court of Claims for compensation. The Inventions Section has been transferred from the War Plans Division to the Operations Division of the General Staff, and all soldiers, irrespective of rank, are urged by the War Department to submit to that body, their ideas for improving army supplies.

¶Alcohol is manufactured from calcium carbide in a plant which recently began operations in Switzerland. About 12,000,000 gal. can be produced annually in the factory, and at a price of $3 a gallon the undertaking is expected to make a reasonable showing of profits.

The Movable Faucet Rack is Shown at the Right in Operating Position. One Faucet Available for Each of the Eight Fish Washers during the Busy Season. When the Catch has been Disposed Of, the Apparatus is Pulled Close to the Ceiling, as at the Left, to Permit the Use of the Floor Space for Other Purposes

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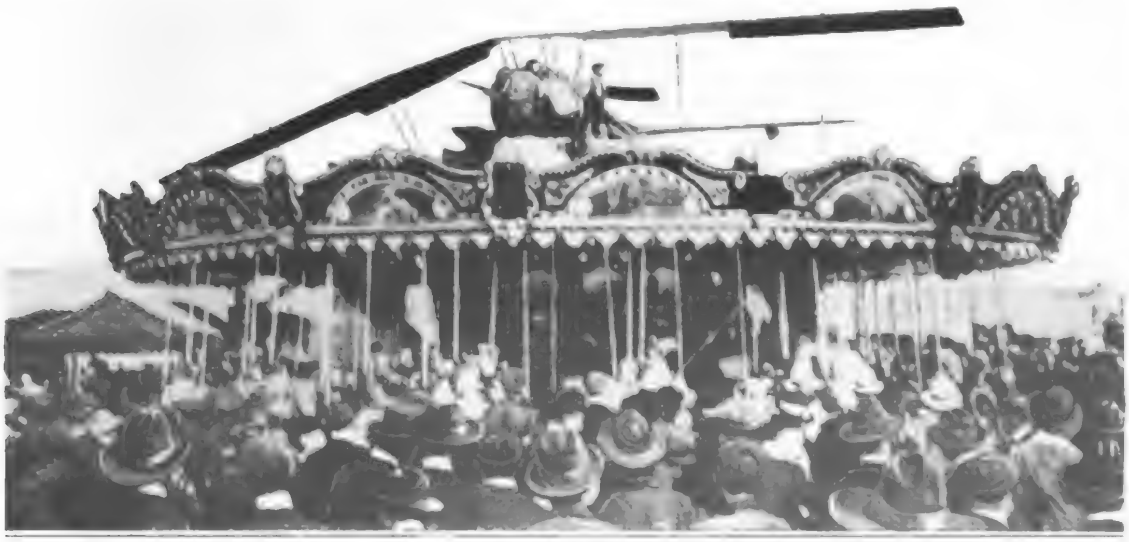


AIRPLANE LANDS ON TOP OF CROWDED MERRY-GO-ROUND

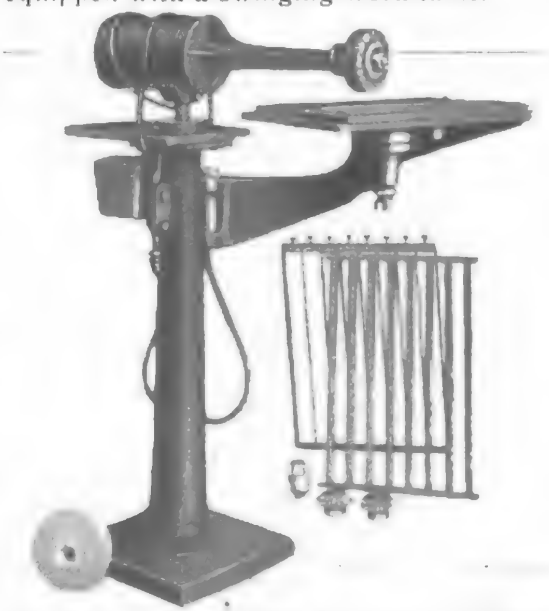
THE fairground at Calgary, Can., was recently the scene of an unparalleled airplane accident. The fair had run to its last day, so the crowd was getting its final taste of the traditional delights of the carnival side shows. The merry-go-round groaned beneath a capacity crowd. Overhead flew an airman of the Canadian army, reputed to have downed 39 German planes. In the observer's cockpit of his plane he carried two boys, sons of a local official. One of the boys is said to have grown excited and pulled a control wire. At any rate, the plane swung down, headed for a fatal smash-up. Luckily it never reached the ground, but encountered the top of the merry-go-round, the guy wires catching the landing wheels and holding the... fast. Airman and boys climbed out uninjured.

## OCEAN BOTTOM TO BE DREDGED IN SEARCH FOR DIAMONDS

To supply the world's undiminishing demand for diamonds a strong company is reported formed for the purpose of dredging the bottom of the Atlantic Ocean. This method of mining the sparkling stones is unusual, yet may meet with some measure of success, as a "chimney" has for years been known to exist off the southwest coast of Africa. Although never definitely located, its existence is considered certain because of the repeated discovery of diamonds in the sand dunes along the coast.

## PRINT-SHOP BUFFING MACHINE ADAPTED TO MANY USES

A machine that cleans and buffs linotype matrices, cleans keyboard cams, grinds knives, molds, cam rolls, etc., drills holes up to $\frac{3}{8}$ in., and routs cuts and plates quickly to any desired depth, is a recent addition to the growing list of printing-office accessories. The feature of the machine is its steel matrix tray, in which a whole font of matrices may be clamped for cleaning in one operation, both sides being buffed by reversing the tray. As the back of the tray is removable, the matrices may be inspected from all sides, and defective ones immediately detected. The tray may also be used for hand cleaning. The removable motor, equipped with buffer, grinder, drill, or router, is easily carried to the work in any part of the shop. The standard supplied is equipped with a swinging work table.



Electrically Driven Buffing Machine for Printing-Office Use, with Special Tray, Seen in Detail Below, for Holding Matrices to be Cleaned

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# FEED CHICKENS BUTTERMILK FROM LARGE DAIRY

**Sixty-Five Thousand Chickens can be Fattened in This Large Feeding Room, Which is Filled with Four-Decked Steel Coops, Mounted on Wheels and Arranged in Rows with Aisles Between. Along the Sides of the Cages Are the Troughs in Which Buttermilk is Poured**

VAST quantities of buttermilk that formerly were allowed to go to waste by a large Indiana dairy are now utilized for fattening thousands of chickens, and the poultry-dressing department, added to the plant when the value of the by-product was realized, has become a real rival of the churns. The latter are capable of making 100,000 lb. of butter each week, which means that thousands of gallons of buttermilk are available.

Poultry is bought over an extensive territory through branch stations, from which it is brought regularly to the main plant. An enormous feeding room, in which 65,000 fowls can be kept, is filled with four-decked steel coops, mounted on wheels and arranged in rows with aisles between for convenience in feeding. Each deck of the coops is provided with two feed troughs, placed on the sides. In addition to buttermilk, the chickens are fed a mixture of corn meal, oatmeal, and rolled oats. Young chickens are fed in the plant 14 days before they are killed, while older fowls have this period reduced to seven to ten days. After being killed and picked, the semidressed poultry is cooled in a room with a temperature of 34° F., and then graded and packed, 12 to each box, for shipment.

**In the Picking Department a Large Force of Men is Kept Busy Removing the Feathers from Poultry. The Fowls are Then Cooled, after Which They are Packed in Boxes for Shipment**

It has been found that the buttermilk diet not only fattens chickens rapidly, but that it gives their flesh a delicate flavor not obtainable in any other way. Everything about the feeding room is kept scrupulously clean



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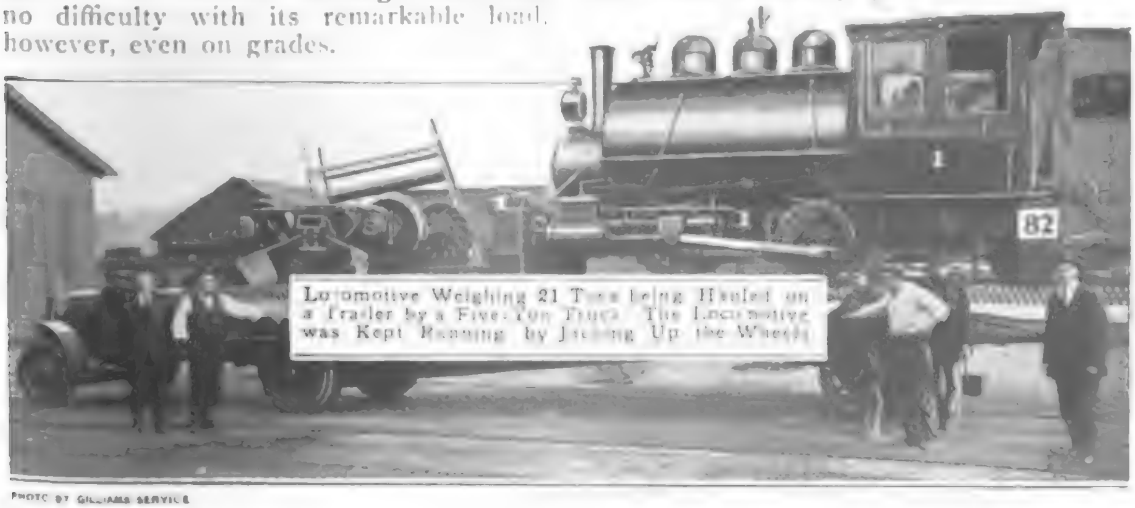
in order to insure a superior product. This is true also of the rooms in which the fowls are killed and dressed. The method of slaughtering is as humane as possible.

## CHEMICAL FILTERS OF WOOL SUBSTITUTED FOR COTTON

Discovery that wool is superior to cotton as filter material, in the manufacture of picric acid for war purposes, has awakened interest in its use by plants producing other chemicals. Although it cannot be used for products of an alkaline nature, since wool is destroyed by alkalis, the experience of war industries indicates that in plants manufacturing tungstic acid, magnesium chloride, Epsom and Glauber's salts, or the sulphates of aluminum and zinc, filters of wool instead of cotton would be of advantage. Wool fibers do not absorb the precipitated matter, and if lightly treated with sulphur will not stain so readily as cotton. The wool pads, therefore, may be washed repeatedly, while the cotton can be used but once.

## LOCOMOTIVE ON BIG TRAILER HAULED BY MOTOR TRUCK

The extraordinary spectacle of a locomotive being hauled about the city by a motor truck was the most striking feature of a recent carnival parade in Portland, Ore. The railroad engine, resting on an 8½-ton rubber-tired trailer, was jacked up with its wheels free and kept running during the trip, which covered some 15 miles. The locomotive, though of an old model, weighed 21 tons, and its supporting timbers about three tons more. The five-ton hauling truck had no difficulty with its remarkable load, however, even on grades.




Locomotive Weighing 21 Tons being Hauled on a Trailer by a Five-Ton Truck. The Locomotive was Kept Running by Jacking Up the Wheels

PHOTO BY GILLIAMS SERVICE

## REPLACING LOST SPECTACLES OF AGED FRENCH REFUGEES

A good many persons are constantly forgetting their glasses, even in the most peaceful circumstances. So it is not to be

New Spectacles for Old Eyes—a Kindly Provision of American Relief Commissions, Which are Supplying Spectacles to Aged French Refugees Who Lost Theirs during the War

wondered at that great numbers of aged French refugees, fleeing before the invader, left their spectacles behind them, and have been unable to do any reading since. American relief commissions have met this contingency, as they have so many others, and the old people are finding new joys in the restoration of their visual powers.

¶Two million bushels of grain can be handled daily by an elevator in Canton, Md. Conveyor and elevator belting installed in the building totals 44,254 ft. in length, and weighs 131 tons. It was shipped to the elevator on seven box cars from a factory in Ohio.

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## TRUCK FOR CHAMBERMAIDS COMPLETELY EQUIPPED

Everything needed by a chambermaid in her work can be carried conveniently on a rubber-tired truck designed for use

With Its Shelves and Compartments Filled, This Rubber-Tired Truck Becomes an Able Assistant to **Every Hotel or Apartment-Building Chambermaid**

in hotels and apartment buildings. The vehicle is of all-metal construction, and has shelves for clean bed linen, towels, and wash cloths. At one end is a large canvas bag for soiled articles. A carpet sweeper, a broom, a feather duster, and other cleaning utensils, are placed at the opposite end. Compartments on top hold soap, electric-light bulbs, safety pins, and other sundries.

## STOPS AND STARTS BIG TRUCK ON TWO-TO-THREE GRADE

Advocates of the system of applying power to all four wheels of a motor truck are jubilant over the recent performance of a vehicle of that class on an artificial grade, near Billings, Mont. The incline is 12 ft. high and 18 ft. long, giving a 66⅔-per-cent slope, hitherto considered practically impregnable to motor-car attack. The forbidding acclivity was not only surmounted by the 6,400-lb. truck, but the driver actually stopped at mid-height, held the wheels easily with the powerful brakes, and then resumed the ascent from that critical position, going over the top without any sign of distress from the motor.

## NAVAL RANGE FINDERS SHOW WAR-TIME IMPROVEMENT

Significant of the progress made during the war in connection with naval guns is the range finder exhibited recently at London by a British concern. Not only is the device considerably larger than those in use before the outbreak of hostilities, but it is capable of regulating fire at much greater distances and with more accuracy than older models. In 1904, when the British navy adopted the range finders with which it entered the war, 5,000 yd. was thought to be the utmost distance at which accurate firing could be done. In the battle of Jutland, more or less precise firing was done at 24,000 yd. by the use of modern range finders.

## PLAN NEW SUBMARINE CABLE UNDER PACIFIC OCEAN

Present submarine-telegraph cable service between the United States and Japan being unsatisfactory, a company has been formed in the latter country for the purpose of laying another line across the floor of the Pacific Ocean. About $25,000,000 will be raised by the oriental financiers for the project, and additional funds are expected to come from this side of the water. It is believed that the new cable will stimulate trade and good feeling between the two nations.

In the First Picture the Truck is Seen Starting up the 66 2/3-Per-Cent Grade; between Positions One and Two It was Stopped and Held by Its Brakes, Starting Again and Going Triumphantly over the Top as the Last Picture Shows

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Specially Constructed Boat Driven by an Engine Taken from a Small Automobile: In the Left-Hand Picture, between the Two Blades of the Rudder, can be Seen the End of the Channel in Which the Propeller Operates. The Right View Shows the Driver Cranking His Engine Just as Though He Were on a Country Road Instead of a River

## ENGINE FROM SMALL AUTO DRIVES CURIOUS BOAT

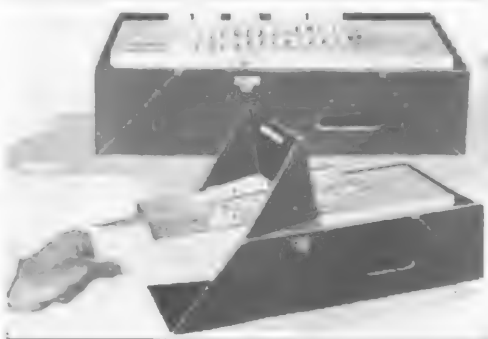
Engines removed from small automobiles have frequently been used as boat motors, but now an enterprising builder has completed a boat especially designed for that kind of motive power. The hull, 25 ft. long and 5½ ft. beam, is strictly flat-bottomed and draws but a few inches of water. Like many other motorboats it has a channel built into the bottom, running in from the stern, in which the propeller operates, wholly above the bottom line of the boat and protected from weeds; it also is provided with a double rudder, one blade at each side of the channel, forming practically a flexible extension of the current of water from the propeller.

## CONSTRUCT BIG LUMBER BOOM IN MISSISSIPPI RIVER

Loading lumber for overseas shipment will be facilitated by a large floating inclosure, or boom, and an enormous wharf that are being constructed in the Mississippi River, at New Orleans, by a lumber firm of that city. The boom will be 1,800 ft. long, and extend into the river a distance of 600 ft., while the wharf will be built on the shore alongside the inclosure. The floating timbers forming the boom will be retained by piles driven into the bottom of the river. At either end are gates, which will permit ships to enter and leave the loading space. The lumber will be dumped into the boom from the wharf, and lifted into the holds of vessels from the water. A storage yard will be located on the shore back of the wharf.

## CHECKS AND DEPOSIT SLIPS SORTED IN INDEXED CASE

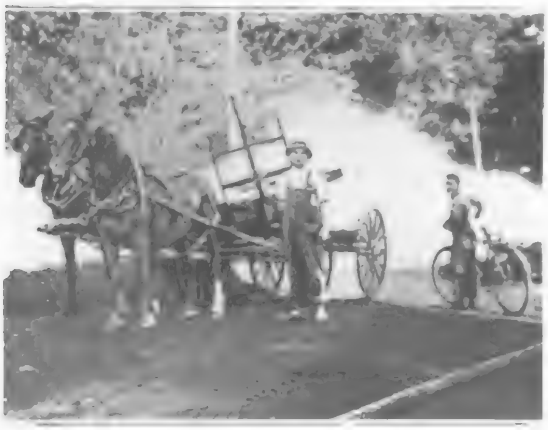
A new indexed case, designed especially for use in banks, is so constructed that both checks and deposit slips can be sorted in it. The device consists of a sheet-steel tray, 16 in. long, 8 in. wide, and 4 in. high, the ends of which are pivoted to swing upward, containing the indexing cards strung on an offset rod which passes through the box from side to side. Checks are inserted between the cards on one side of the rod, while deposit slips are placed in their proper classification on the opposite side. By lifting the ends of the tray, the ends of the papers are exposed, and they can be removed with ease.



Indexed Case for Checks and Deposit Slips: The View Below Shows How Papers can be Removed from the Device

## WAGONLOAD OF HAY BURNED IN UNUSUAL FIRE

The calm of a residential street in a Canadian city was rudely shaken recently when a wagonload of hay, drawn by two



Picture Taken Shortly After Fire had Destroyed a Wagonload of Hay in a Canadian City Street: Friction is Believed to have Started the Blaze

horses, on the thoroughfare suddenly burst into flames. By quick work, the driver was able to save the animals by unhitching them from the wagon. An alarm brought the fire department to the scene, and it was possible to prevent the destruction of the running gear of the conveyance, though the hay and the hay-rack were almost entirely consumed. It is believed that the unusual blaze was started by friction between an iron bar on the rack and the hub of one of the wagon wheels.

## RECORD MOUNTAIN ASCENTS WITH PILES OF ROCKS

Mountain-climbing history is recorded in a novel manner on the summits of California peaks. When an ascending party has reached its elevated destination, each member places a rock on a pile

Each One of the Rocks in This Pile Represents an Ascent of the Mountain on Which It is Located. Fifty Years Were Required to Accumulate These

which has accumulated there through similar action on the part of all who have negotiated the eminence. In the case of Mt. Whitney, the highest peak in the United States and one of the most difficult to climb, the pile of rocks is very small.

## WOULD STUDY TROPICAL ILLS IN SHIPBOARD LABORATORY

Diseases of the tropics, where so many maladies thrive, may form the subject of intensive local study, if the suggestion of an eminent English physician continues to sustain the interest it has already aroused in scientific circles. The plan is to outfit a ship with all the necessary paraphernalia and laboratory equipment, man it with students of medicine representing various nations, and visit the tropical possessions of America, Great Britain, France, and Italy. Inspiration for those now combating disease in the tropics, and a closer bond of international friendship, would undoubtedly result from such an enterprise.

## ENORMOUS WOODEN DERRICK MADE OF GIANT TREES

Kings among the giants of the forests were felled to furnish material for the construction of an immense wooden derrick, probably the largest lifting device of its type in the world, which is used in a western-coast shipyard for placing boilers and other heavy fittings aboard launched hulls. Four great fir trees were used. Each one of these was 300 ft. high and 5 ft. through at the base.

Carpenters shaped the logs into tapering masts, 112 ft. 8 in. long, 3 ft. 6 in. in diameter at their larger end, and about 2 ft. through at the opposite end. The four masts were fastened together to make two A-shaped frames, one of which serves as the mast of the derrick, and the other as the boom.

Heavy steel cables guy the lofty contrivance, while two ⅞-in. steel ropes, each 1,250 ft. long, are used for hoisting. A 40-hp. electric motor furnishes power for this and for regulating the position of the boom. Nine piles, lashed and bolted together, form the foundation of the derrick. On this is placed the concrete-filled steel casing on which are mounted the enormous ball-and-socket joints in which are fitted the lower ends of the boom masts. Sixty tons can be lifted by the derrick at a 62-ft. reach.

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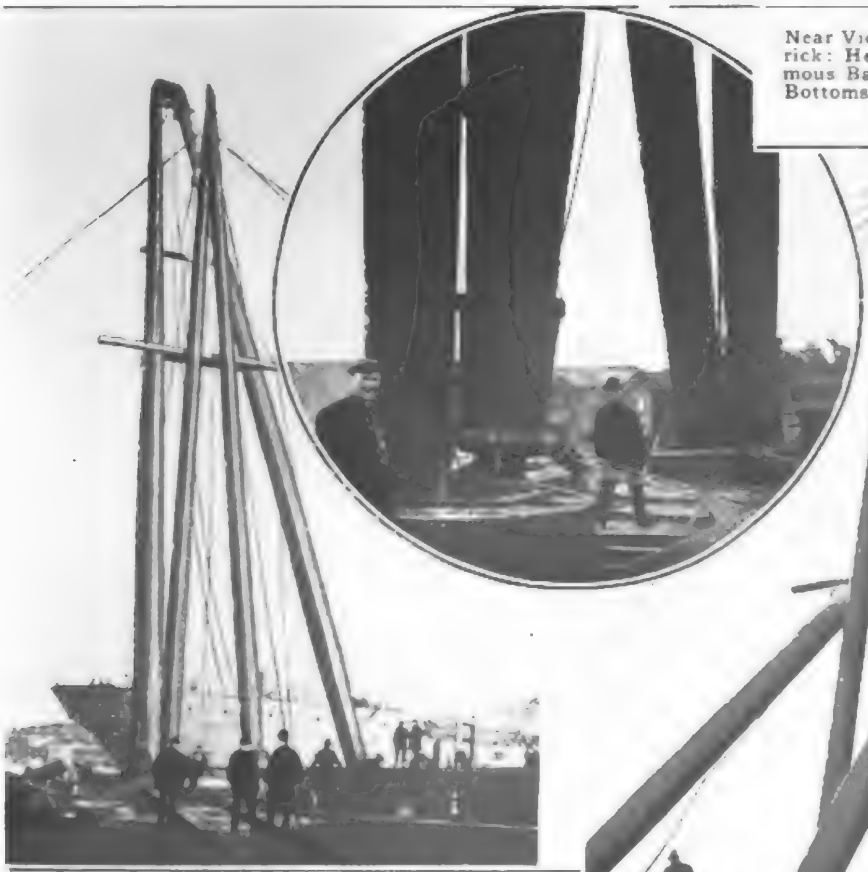
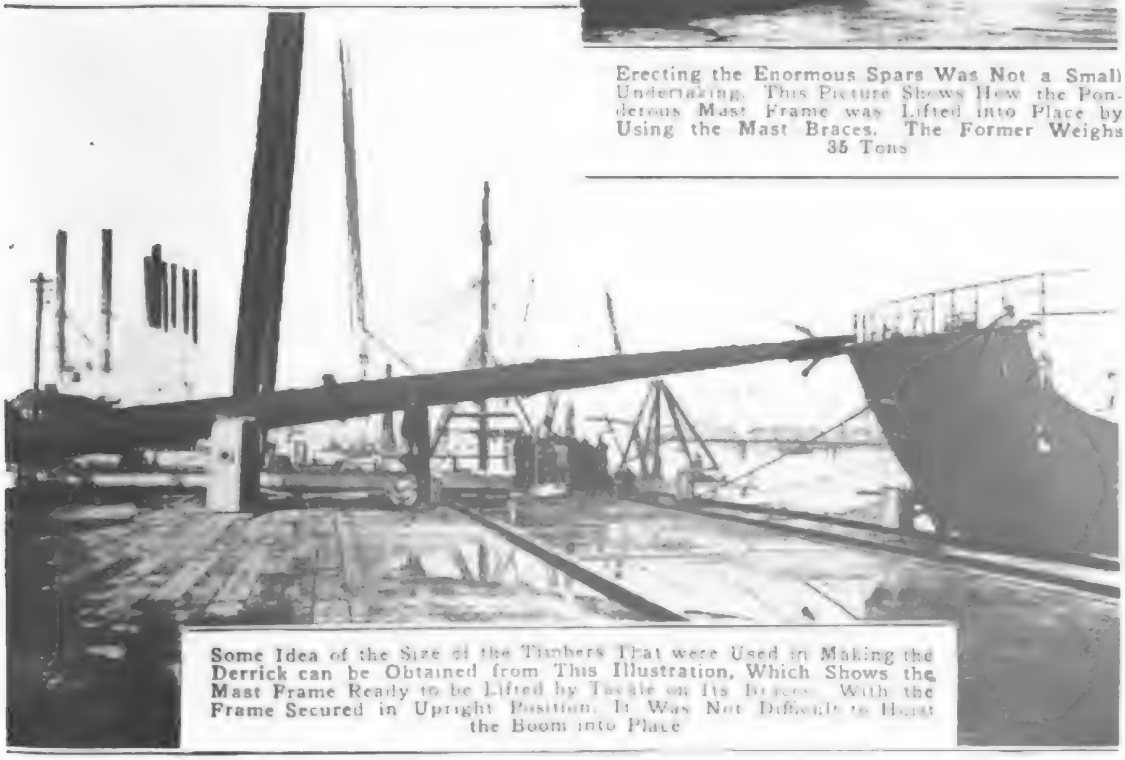


Near View of the Base of the Derrick: Here can be Seen the Enormous Ball-and-Socket Joints at the Bottoms of the Two Masts Which Serve as a Boom

Ready to Perform the Tasks for Which It was Constructed, This Great Wooden Derrick Towers Over 112 Feet into the Air at a West-Coast Shipyard, Where It will be Used for Lifting Boilers and Other Heavy Fittings aboard Launched Hulls. Trees 300 Feet Tall were Felled to Make the Lofty Masts

Erecting the Enormous Spars Was Not a Small Undertaking. This Picture Shows How the Ponderous Mast Frame was Lifted into Place by Using the Mast Braces. The Former Weighs 35 Tons



Some Idea of the Size of the Timbers That were Used in Making the Derrick can be Obtained from This Illustration, Which Shows the Mast Frame Ready to be Lifted by Tackle on Its Braces. With the Frame Secured in Upright Position, It Was Not Difficult to Hoist the Boom into Place



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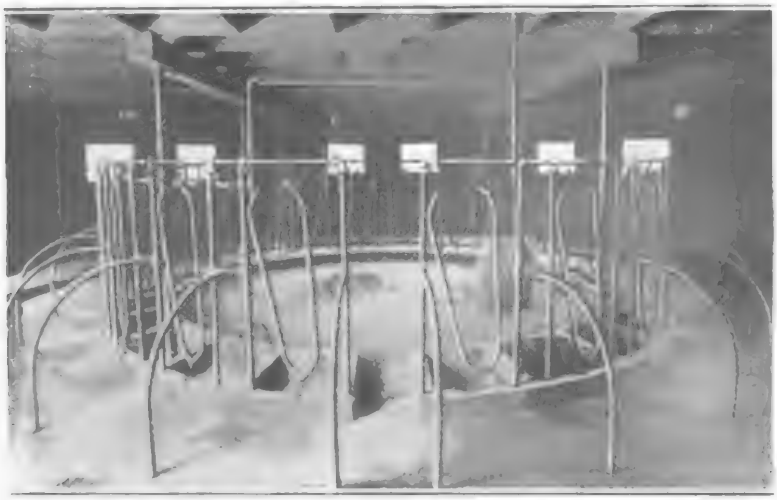
## CHORES SOON OVER IN ROUND DAIRY BARN

A mid-western farmer owns a circular dairy barn which makes care of the cattle unexpectedly easy. The simple iron stalls are arranged in a circle on the concrete floor. Before each stall, as part of the stone floor, is a feed box. As the feed is dumped into the center of the circle from an upstairs loft, the farmer can thus feed all his cattle with a minimum of effort. A circular drainage "ditch" encourages frequent flushing.



**Standing in the Center of This Circular Cow Stable, the Farmer can Feed His Cattle with Ease. The Simple Concrete-and-Iron Construction, Coupled with the Novel Stall Arrangement, Makes for Cleanliness and Order**

## CHINESE PILGRIM TRAVELS IN UNUSUAL MANNER

Every inch of the road he travels, a Mongolian pilgrim will cover by prostrating himself along the ground. He is journeying from his native province to Lhasa, the Buddhist Mecca, in the hope that the health of his mother will be improved because of his sacrifice. Lying down, he marks the point to which his outstretched hands have reached, arises, puts his toes on that mark, and repeats the process. By this means he travels about six miles a day in level country, and half that distance in the mountains. A leather apron protects his body, and he wears wooden shields on his hands.

¶ Potassium salts have been found in the brine of certain Chinese salt wells, it was announced recently. There are over 1,000 of these wells in one locality, ranging in depth from 1,000 to 3,000 ft., and dug by a primitive method.

## STUDY ANATOMICAL STRUCTURE WITH MOTION PICTURES

Inspired by the success of motion pictures as teachers of airplane and engine construction, a British army surgeon has prepared a series of anatomical films which have proved highly valuable in classroom work. In the pictures a complete skeleton is first displayed at all angles, and then begins to disintegrate, the process being slowly continued until the backbone alone is left. The skeleton is then reassembled, each bone being clearly indicated before it takes its place, to impress its form and purpose firmly upon the minds of the spectators. The same investigator has also made film studies of abdominal reflexes of great scientific value.

## FARM PRODUCTS ADVERTISED ON NOVEL SIGNBOARD

Fresh farm products are difficult to obtain in city markets. Realizing this, the proprietor of a farm located on a much-traveled road near a large city of the Middle West advertises eggs, butter, and poultry on a novel signboard, and draws many customers from among the motorists who drive that way. A gigantic figure, representing a traffic policeman, is combined with a road map of the vicinity, so that the sign is not only likely to be noticed, but is valuable to drivers who are uncertain about the routes. Moderate prices are asked for the articles sold.

**How an Enterprising Farmer of the Middle West Advertises His Products to Motorists, and Assists Them at the Same Time**

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The British Royal Camel Corps, Operating in the Far-Eastern Campaigns, Formed as Odd a Military Unit as Any That Entered the Great War. It Proved Very Useful, However, in the Territory to Which It was Adapted

# DEMOBILIZING THE CAMELS

By GEORGE F. PAUL

WITH the demobilization of the royal camel corps, formed in Asia by the British to fight the central powers, there has disappeared one of the most interesting organizations of the British army. The part played by the war camels during the campaign of El Arish, Magdhaba Rafa, and in the first battles of Gaza, is historic and full of glory for the famous corps. Out of one company that entered battle with 250 camels, only 20 remained alive at the end of the day's fighting. The royal camel corps received most effective aid from the two batteries of camels from Hongkong and Singapore.

The British government has used various types of camels for mounting this corps, the principal ones being the Sudanese and the Egyptian. The Sudanese camel has one characteristic which is of the greatest advantage in campaigning in the desert, and that is its ability to go for seven days without drinking water. The Egyptian camel, on the other hand, cannot go more than two days in hot weather without water.

On Forced Marches through Desert Regions, Where Food and Water were Not to be Had and Provisions could be Packed for the Rider Only, the Military Camel's Peculiar Characteristics Made It Valuable to the British Arms

It is generally believed that the camel is one of the most patient of the beasts of burden, and that it possesses great powers of endurance. This belief is erroneous, for the camel is very delicate in some respects, and unless great care is given it, it cannot endure service for long periods. The most delicate of all is the camel of Hindustan. Nothing is more disagreeable and tiresome than the first days given to training camels of this type. The sudden manner in which they leap to their feet and their peculiar gait make them more difficult to handle than others. They must have their allotted rations at regular intervals. More obstinate than the mule and even wilder, there are certain periods of the year when the camel is a veritable demon; it becomes intolerable from the way that it kicks, bites, and fights with the other camels. The camel is not sure of its footing on ground that is moist and slippery. Then it tumbles around like a person learning to skate.

During the operations in Palestine and in the regions farther to the north, the horse proved far superior to the camel, and at times the soldiers of the royal corps were compelled to travel on foot or mount horses, abandoning their arms and baggage. On one occasion it was found necessary to abandon more than 100 tons of materials because the camels could not advance over the bad roads.

However, they repeatedly proved their worth on forced marches through regions where provisions and water were extremely scarce, and they showed their willingness to share the soldier's lot, no matter what it might be. Many of the camels are so light in color that they could not be brought up to the firing line, but on many occasions they have



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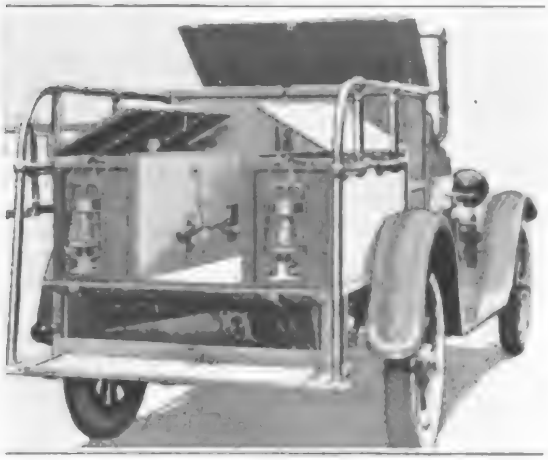
been exposed to fire and have borne their wounds with stoical fortitude. When the camel drivers went to the trenches, the camels remained back in the second line, but even here they did not always escape the fate of their human companions, for many of them fell victims of shells and gas.

## GAS COMPANY'S TRUCKS AID CITY FIRE DEPARTMENT

Illuminating gas greatly increases the danger incident to fires in large cities. Quite frequently pipes containing gas are severed by heat or the collapse of structures, and disastrous explosions result, or firemen or others in the buildings are asphyxiated. Recognizing the fact that fire departments are not provided with sufficient means for coping with this peril, a gas-manufacturing company of Boston has equipped 15 swift motor trucks with materials for rescue and repair work in such emergencies, and these answer fire alarms to supplement the municipal fire-fighting apparatus. The trucks are stationed in different parts of the city so that any location can be reached in a brief time. Two gas masks, a pulmotor, two fire extinguishers, a first-aid kit, ladders, rescue ropes, and an assortment of tools are carried on each truck, which is in charge of a crew of three men.



One of Boston's Rescue and Repair Trucks Designed to Lessen the Danger of Illuminating Gas at Conflagrations: A Gas-Manufacturing Company Operates 15 of the Machines

## MINNESOTA TOWN VISITED BY VIOLENT STORM

Buildings of strong construction were torn to bits and scattered by a cyclone of terrific violence which swept through Fergus Falls, Minn., in the early summer, killing and injuring many persons. The property loss is estimated to have been $4,500,000. Numerous families were left without homes after the storm, which is considered one of the most destructive in the history of Minnesota, and some of the town's public buildings were left in ruins.

Ruins of the Courthouse and Jail in Fergus Falls, Minnesota, after the Great Storm: Many Persons were Killed and Injured by the Cyclone, Which Damaged Property in the Town to the Extent of $4,500,000. This Picture was Taken Shortly After the Tornado had Passed

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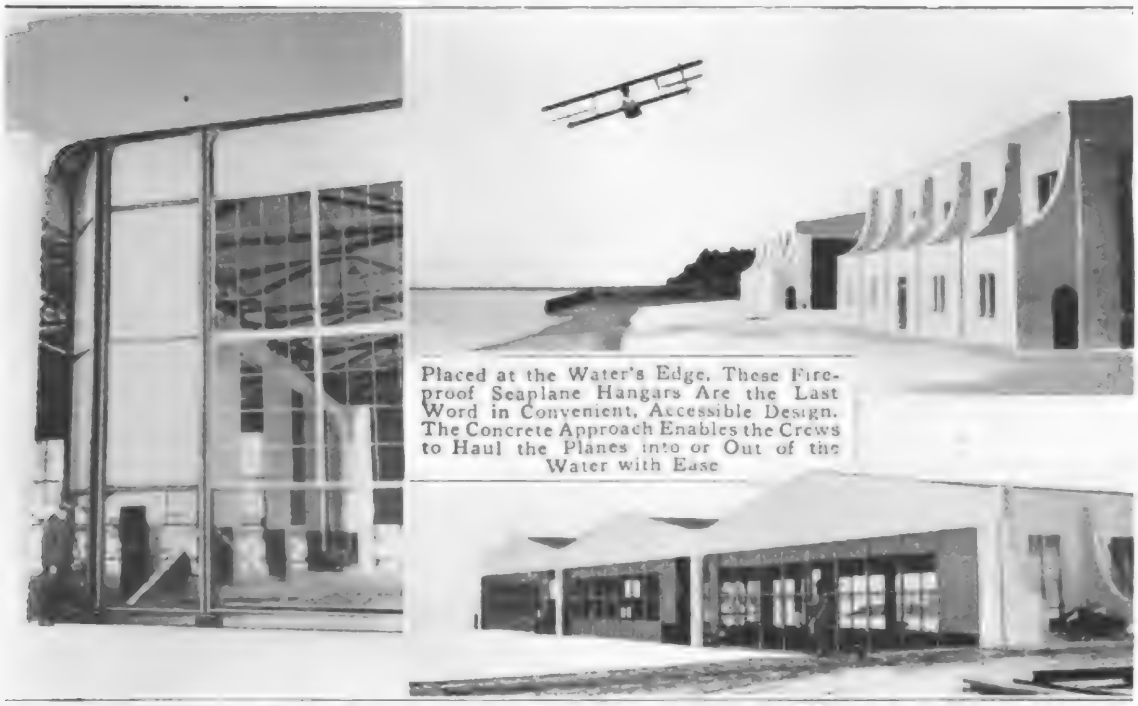

Placed at the Water's Edge, These Fireproof Seaplane Hangars Are the Last Word in Convenient, Accessible Design. The Concrete Approach Enables the Crews to Haul the Planes into or Out of the Water with Ease

**At the Turn of a Switch the High Steel Doors at the Left Roll Open or Shut, Making It Possible to Isolate Any or All of the Hangars in Case of Fire. The Photograph at the Lower Right Gives a General View of the Construction, Showing How Every Possible Square Inch is Devoted to Window Space So That Interior Lighting will Be Ample for Repair and Construction Work**

## FIREPROOF SEAPLANE HANGARS BUILT AT WATER'S EDGE

Six seaplane hangars, now nearing completion at a U. S. naval air station, represent a perfection in hangar design that matches the improvements in seaplane construction. Each costs $50,000, and has been planned to give the maximum efficiency in housing and handling naval airplanes. All are absolutely fireproof, being built of concrete and steel. Large windows and skylights give an abundance of natural daylight for mechanical operations on the planes. Motor-driven roller doors of steel and wire glass may be opened or closed by the turn of a switch. Best of all, from a timesaving standpoint, is the location of the hangars. They are directly at the water's edge, with a wide pavement of concrete permitting easy transportation of the seaplanes to and from the water.

## MADRID'S PUBLIC LAUNDRIES EQUIPPED WITH BARROWS

When the women of Madrid, Spain, have done their family washings in the city's public laundries, they load the clean clothes into large wheelbarrows and take them to the clotheslines. Though a large space is covered with lines at each laundry, an unoccupied line near the tubs is often not available, and it sometimes is necessary to go a quarter of a mile to find a place to hang the wet clothes. The wheelbarrows are found to be very convenient in such exigencies. A number of the primitive conveyances are kept waiting at all times for the Spanish washerwomen.

**Wheelbarrows are Provided at the Public Laundries of Madrid, Spain, for Use by Washerwomen in Conveying Wet Clothes to Lines for Drying**

¶ Battling snowdrifts, similar to those which prevented the success of an earlier attempt by an army tank, a five-ton endless-tread tractor recently reached the summit of Pikes Peak.

One of the Floating Salmon Canneries Used in the Northwest: Built on the Scow Is a Complete Canning Plant, with Living Quarters for the Men Required to Operate the Cannery and Care for the Boat

## BIG CENTURY PLANTS BLOOM UNNOTICED IN DESERT

Century plants of great height, compared with tub-grown specimens, bloom and die unnoticed in the deserts of the Southwest. After remaining an inconspicuous rosette of thick, green leaves for 30 or 40 years, the length of time depending upon climatic conditions and the character of the soil, the strange plant begins preparations for its long-deferred blooming by sending up a thin, tapering stalk, which often grows to a height of 18 or 20 feet. On this are borne brilliant yellow flowers. Soon afterward the leaves turn purple, and the plant remains practically dead until the next blooming period.

Gigantic Century Plants of the Southwest. In the Picture Above is Shown a Clump of the Tall, Flower-Bearing Stalks. Their Height can be Judged by Comparing Them with the Figure of the Man. At the Right Is a Closer View of a Single Specimen

## FLOATING SALMON CANNERIES BUILT ON SCOWS

Instead of bringing fish to canneries, a salmon-canning company which operates in the Northwest sends canneries to the fish. This is done by building a completely equipped canning establishment on a large scow, adding living quarters for the men required to handle the boat and manipulate the canning machinery, and towing the floating cannery wherever the salmon are running heaviest. Three of the unusual craft are now in use. During a season each one of these canned approximately 30,000 cases of fish. Among the features of the living quarters on the scows are shower baths and lounging rooms.

## TO TRANSPORT MERCHANDISE VIA HYDRAULIC TUBE

Using a hydraulic tube somewhat as the pneumatic-tube system is now employed, but on a larger scale, a newly organized English concern expects to achieve wonderful results in merchandise transportation. The arrangement contemplates an iron pipe, perhaps two feet in diameter, connecting the traffic terminals, in which containers, about four feet long, buoyed to the specific gravity of water, would carry some 500 pounds of goods apiece. With the containers four feet apart, and the pipe filled with water moving at 10 to 20 miles an hour, a 120-mile pipe would have a capacity of 20,000 tons, or 165 tons per mile. Siphon action would carry the containers over hills and valleys, and even under the Channel.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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# SMOKELESS POWDER FROM TREE STUMPS WAR DEVELOPMENT

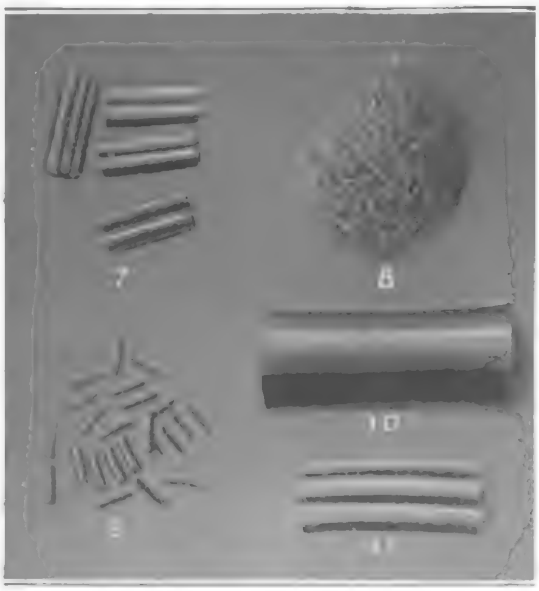
By E. T. BRONSDON

IF ever again the United States meets with the great misfortune of being forced into another war, one necessary item, at least, will not cost so much to the nation. That item is smokeless powder.

After April, 1917, the price of cotton soared. The country as a whole paid for cotton linters by the thousands of tons. These tangled clippings from the cotton-mill spinning rooms, really nothing but weaver's waste, cost us two and one-half cents a pound. Before the war they went begging at one-half cent a pound. The poorer grades of raw cotton, even, were transformed into linters to supply the demand at this price. Every man, woman, and child in the United States felt the pinch. Each family pocketbook was called upon to purchase dresses, stockings, handkerchiefs, and all other necessary cotton articles at prices that would have purchased silk or linen in 1914. It was one of the hardships of war, and no one complained.

This Expert of the Forest Products Laboratory Proves That Familiarity Breeds Contempt by Lighting a Cigarette from a Burning Stick of Smokeless Powder

The government, however, saw that, if the war continued much longer, the bill for smokeless powder alone would become oppressive, not even considering the bills civilians would have to pay. It called upon the experts of the Forest Products Laboratory at Madison, Wis., to attempt the manufacture of a usable grade of nitrocellulose from wood. Nitrocellulose (more properly cellulose nitrate) is the basic substance from which is made the smokeless powder used in every army rifle, and all machine guns, mortars, fieldpieces, and land and naval heavy artillery. Corn pith was mentioned as a possible alternative for wood, if the latter material did not "prove up."




For Different Purposes Smokeless Powder is Prepared in Different Forms. Number 7 is Intended for the 12-Inch Mortar; 8, for an Army Rifle; 9, for the 75-Millimeter Gun; 10, for the 16-Inch Naval Gun, and 11 for the 12-Inch Naval Weapon

Immediately a series of experiments with many varieties of wood was begun. Within two months the laboratory announced success, and nitrocellulose that could be made into smokeless powder was shipped to Washington for official test.

The first exhaustive tests resulted in the new material being turned down. The laboratory experts had been handicapped by an entire lack of specifications or data on the requirements their nitrocellulose had to fulfill. It was found that their first batch was very dark in color, while that made from cotton linters was almost white. For some reason it proved to be the case that dark-colored nitrocellulose was not easy to handle, and the powder made from it not sufficiently stable. The experiments were resumed.

Three weeks later unimpeachable results were obtained. Not only had the laboratory succeeded in producing a light-colored nitrocellulose from wood, but the experts had found means for stabilizing the darker material and making it just as satisfactory. Government tests on an extensive scale confirmed these results.

The processes involved were simple.



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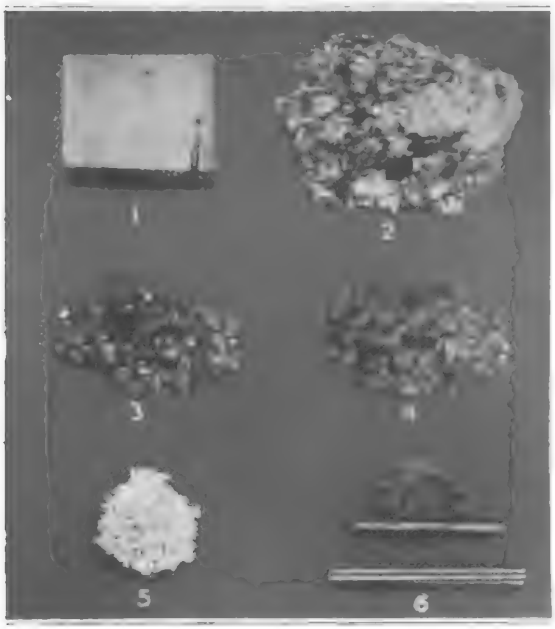
First, the paper pulp was made from the chipped and purified wood—usually jack pine, although other woods were found suitable—and then this was treated with




To Effect the Transformation from Pine Wood to Explosive, the Block at the Upper Left is Pulped, Subjected to Nitrating Acids, Washed, Mixed with Ether and Alcohol, and Finally Made into "Macaroni," as the Finished Product is Called

nitric and sulphuric acids for the purpose of nitration. After "digesting the acids," the pulp went to a steel centrifugal wringer; then it was wrung again, to remove the last traces of acid, and lastly the mass was thoroughly mixed and softened with a solution of ether and alcohol, both solvents for nitrocellulose, and placed in a machine where it was made into "macaroni." This actually is the name given to smokeless powder in its final stage, as it is pressed through perforated plates just like the sticks from which the Italian national dish is prepared. In the smokeless powder even the fine stalks, about the size of spaghetti, used in the cartridges of army rifles have a hole the full length to make the burning quicker and more even. In the larger canes many such holes are provided.

One conclusion reached by the Forest Products Laboratory in respect to the manufacture of smokeless powder by this means is almost as worthy of notice as the achievement itself. For raw material pine stumps are probably best. The laboratory recommends that this powder be made exclusively from the stumpage on waste land in the South. The price paid for the stumps when delivered—from one to two cents a pound—would actually yield a small profit to the land owner clearing his land in this manner; millions of acres of deforested land in the South, which heretofore has lain uncultivated because of the cost of removing stumps, thus would be thrown open to agriculture, and at a profit. At a time when the world needs every pound of food that can be grown, and every yard of cotton that can be woven, this recommendation should be given the most serious consideration.

## SAILORS EMPLOYED TO MEND RIGGING ON "AERIAL RIDE"

The proprietors of an amusement park were recently confronted by the task of repairing the upper rigging of the popular "aerial ride," in which the passengers are whirled about a high central tower. A number of workmen were known to have the skill required for the job, but none cared to venture so far from the solid earth. So the proprietors applied at a near-by naval station, and were soon supplied with two newly discharged sailors who considered the job child's play.

Local Workmen Refused to Repair the "Aerial Ride" at the Left; So the Proprietors of the Amusement Park Hired Two Discharged Sailors for the Job. Despite the Danger of the Work, Seen at the Right, It Was Play to the Two "Gobs"

¶The Danish ministry of traffic is working out a plan for the erection of a great radio station at Copenhagen for direct wireless communication with the United States.

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When This Remarkable Photograph of the Deck of the Steamship "Western Knight" was Taken, the Vessel was Near Foundering on Its First Voyage. Too Low Ventilators Admitted Water to a Hold, Causing a List That Placed the Ship at the Mercy of the Waves

## STEAMSHIP'S MAIDEN VOYAGE TURNS OUT DISASTROUSLY

Encountering a storm of unusual violence 200 miles off Cape Flattery, the recently completed steel steamship "Western Knight" nearly foundered on its initial voyage from Puget Sound, and was forced to return to port. An investigation disclosed that the unfortunate experience was due to the low position of the vessel's ventilators, into which the high waves dashed, flooding one of the holds. This caused the ship to list heavily. In this position the steamer fought a losing battle with the sea, until it became evident that disaster would result if the voyage were continued. The "Western Knight" is an 8,800-ton craft and was built for the United States Shipping Board.

## ELABORATE PHONOGRAPH BUILT IN FIREMAN'S SPARE TIME

A remarkable phonograph, standing five and a half feet high and ornamented to the taste of an Indian rajah, is the finished product of a Pittsburgh fireman's spare time for three years. The machine weighs 300 lb., and the cabinet is made entirely of hand-finished chestnut wood. Intricately carved designs embellish all the panels, and behind the fretwork of the canted corners are long, narrow mirrors; while at the very top is perched a small, but finely wrought, sphinxlike image. The curved horn inside is built of laminations cut from wood

The Great Phonograph with Its Intricately Carved Panels and Handmade Horn of Old Wood; and Its Maker, a Pittsburgh City Fireman

75 years old, each layer coated with lamb's wool. Most of the work was done at the fire-engine house.

## FARMER MAKES TRACTOR HELP TO BUILD HIS BARN

Many farmers have discovered, with characteristic ingenuity, that a tractor may be made to serve other purposes than merely pulling a plow. The owner of a New Jersey farm recently completed a large barn, the framework of which was erected almost entirely by tractor power. The heavy beams were hoisted into place by passing a rope through a block and tying the end to the tractor, which, instead of winding it on a winch, simply ran across the field with it, completing the job in a hurry.

Erecting the Framework of a Large Barn with the Help of a Tractor, by the Simple Method of Tying a Rope on the Machine and Then Running It the Proper Distance to Hoist the Beams

## NEW YORK POLICE EXPERTS TO X-RAY ALL BOMBS

In a basement room of New York City police headquarters is to be installed an X-ray apparatus for the examination of all bombs received by the department. Any person living in New York who receives a bomb, or something he believes to be a bomb, will communicate at once with the police. The suspected object will be rushed to the testing chamber, and there subjected to the X-rays by members of the "bomb squad" acting with experts from the U. S. Bureau of Mines. As a result of this safer and more scientific examination, the "bomb squad" hopes to obtain valuable clues to the origin of these infamous weapons.

## HYDROELECTRIC POWER PLANT FOR CANADIAN CITIES

Electrical energy will be furnished the Canadian cities of Fort William and Port Arthur by a dam and power plant being constructed at Cameron Falls, on the Nipigon River, by the Hydroelectric Power Commission of Ontario. The project will cost about $3,500,000. Water will be impounded by a dam 30 ft. high. At the beginning, only two units, capable of developing 10,000 hp. each, will be installed, though the possibilities of the construction are 70,000 hp., requiring additional generating units. The current will have a force of 6,000 volts as it comes from the dynamos, but will be raised to 110,000 volts for transmission. Before entering the cities, approximately 70 miles away, it will be lowered to 22,000 volts. For actual use it will be reduced to 2,200 volts.

## PRIMITIVE SUNDIAL USED BY MEXICAN INDIAN

While not as exact in the information it imparts as a jeweled watch, a sundial of very primitive construction, discovered in Mexico by an American engineer, serves satisfactorily as a timepiece for its owner, an Indian woodcutter. It was made by nailing the circular bottom of a tin lard pail to the side of an inclined post, then driving a long spike a short distance into the post through the center of the disk. The shadow of the spike indicates the flight of time, measured by scratches on the tin disks.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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# HUGE TREE HUMBLED BY FEW POUNDS OF DYNAMITE

Government forestry officials recently gathered on a Pennsylvania farm to watch an expert destroy a famous chestnut tree, known as the largest of its kind, and, except for the redwoods of California, as the largest of any kind in the United States. Three to four hundred years old, the tree had developed the enormous girth of 34 ft. 6 in. But the expert set out to show that the slow work of centuries counted for nothing in the face of a little well-placed dynamite. So, with a mechanical drill, he quickly bored 24 holes around the base, filled them with 110 lb. of dynamite in 220 cartridges, and retired to his detonating switch 600 ft. away. A motion of the handle threw the old giant high into the air.

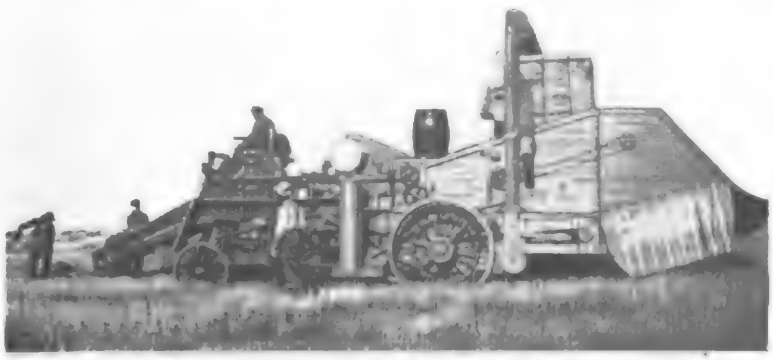
With This Compressed-Air-Driven Auger the Expert Drilled 24 Holes about the Base of the Tree. In These He Placed 110 Pounds of Dynamite in 220 Cartridges

The Dynamite was So Skillfully Placed about the Base That the Huge Tree was Completely Shattered

Forestry Officials are Examining the Venerable Chestnut Tree Before the Dynamiting Commenced. The Tree Was the Largest of Its Kind in the United States

# AUTOMOTIVE THRESHER GOES FROM SHOCK TO SHOCK

A threshing machine which does not require the wheat to be brought to it, but goes through the field from shock to shock, is used by some of the large wheat growers of western Canada, having been invented by an Alberta man. An automobile motor propels the machine, one man driving and another operating the thresher. Four field men pitchfork the sheaves onto the conveyor which carries them into the machine, and the work progresses very rapidly. The consequent saving of time is an important factor in the enormous wheat fields of the West.



This Canadian Threshing Machine Has an Automobile Motor, and Travels about the Wheat Field, Threshing as It Goes. It Uses Two Men, One to Drive and One to Operate

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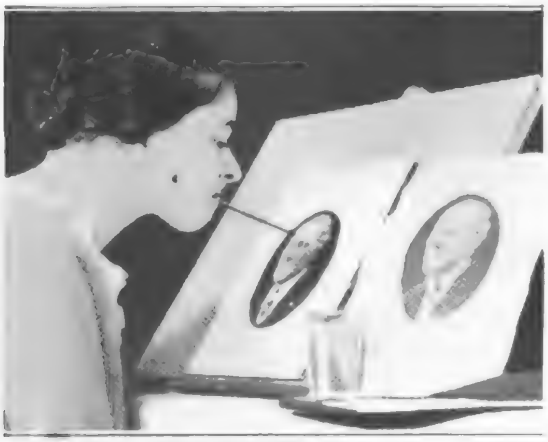
## HANDS USELESS, ARTIST HOLDS BRUSH WITH HER TEETH

About a portrait of himself, lately sent to President Wilson, clings the pathetic and inspiring story of the 19-year-old



Daily for More Than Two Months This Plucky Little Artist Worked on Her Portrait of President Wilson. Lacking the Use of Her Hands, She has Schooled Herself to Wield the Brush in This Way

artist, so crippled by rheumatism that she paints with the brush held between her teeth. Every afternoon for more than two months her family placed the paint box, cup of water, and brushes on a table before her. Laboriously then, performing every operation with her teeth, she mixed the colors and proceeded with her work on the portrait. Until a year ago she was able to work at her beloved art in the normal way, despite her affliction. Then an automobile accident injured her hands, threatening to deprive her of even that solace. But her eagerness for the brush sustained her during months of tedious and discouraging practice with her teeth, until now she can point with modest but just pride to the unique portrait as proof of her success.

## BRITAIN BUILDING WORLD'S LARGEST DIRIGIBLE

The construction of a great dirigible that will carry six airplanes for its own protection is said to have been begun by the British government. When finished, in 18 or 20 months, the craft will measure 1,100 ft. long and 137 ft. in diameter, giving a capacity of 10,000,000 cu. ft. and a lift of 200 tons. It is computed also that the cruising radius will be 16,000 miles, or enough to make the long journey from England to Australia a performance of no particular difficulty.

## MISSISSIPPI TOURED BY NAVY SEAPLANES FOR FIRST TIME

Navy seaplanes flew up the Mississippi River a few weeks ago for the first time in history. As part of a large flotilla which embodied almost every type of craft and instrument used in antisubmarine warfare, they visited city after city. Each was "bombed" in turn with clouds of literature about the navy and the advantages of enlistment. Unconditional surrender usually followed, with a dinner to the airmen and the ships' officers. The cruise was made for the purpose of interesting the river cities in navy life, and thus stimulating enlistment.

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Navy Seaplanes Flew up the Mississippi River Recently for the First Time. The Three Planes are Here Moored to the Old Levee at Memphis, Tennessee, Where They Form an Interesting Contrast to the Traditional River Boats in the Background

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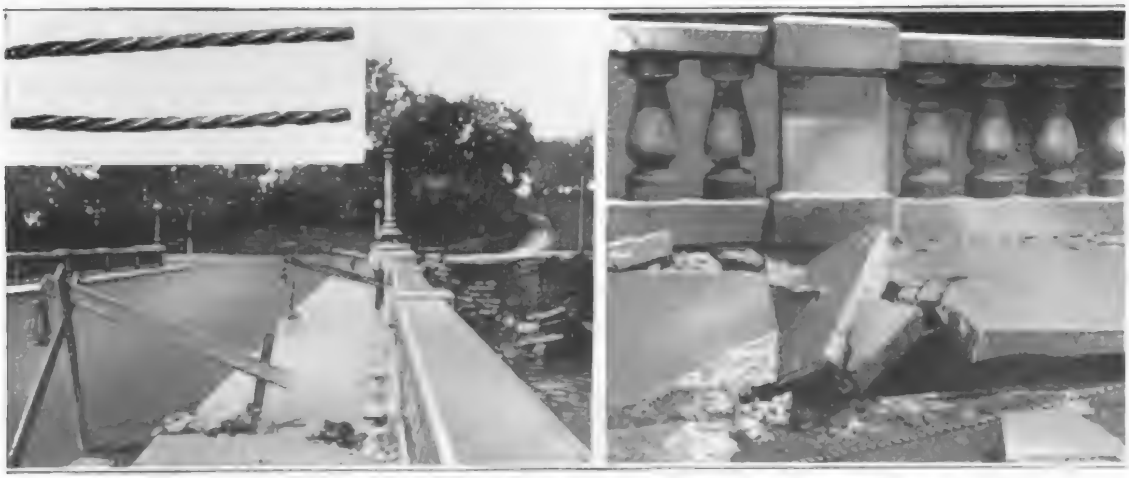

On the Left Is a General View of the Shattered Section of the Bridge, and at the Right the Sidewalk and Railing Separated by the Bolt. The Insert Pictures Two Stretched Reinforcing Rods

## LIGHTNING DAMAGES BRIDGE OF REINFORCED CONCRETE

Some unexpected results were produced when lightning struck a reinforced-concrete bridge across the Iowa River, at Iowa City, and damaged the structure to the amount of several thousand dollars. One of these was the complete separation of a concrete sidewalk, built along the side of the span, from the bridge itself. The massive side rail contiguous to the walk was moved a noticeable distance toward the edge of the bridge, while the sidewalk was shoved in the opposite direction, and cracked across in several places. The damage extended along a section 100 ft. long. As a result of this shifting, many of the ½-in. twisted-metal rods which bound the side rail to the bridge were torn from the concrete in which they were imbedded, broken in two, and the pieces dropped into the conduit beneath the sidewalk. When recovered these were found to have been reduced to ¼-in. rods through stretching.

## MEXICO HAS OIL WELL CAPPED WITH ICE

About 14 miles south of Tampico, Mexico, there is an oil well whose casing head is caked with and surrounded by ice to the extent of several tons. Even the derrick floor is covered with it. The oil and gas, when encountered at a depth of 3,000 ft., shot upward with a pressure that threw the drills and casing hundreds of feet in the air. Now the gas leaking out around the heavy gate valve, through the sudden expansion on its release, absorbs so much heat that all surrounding moisture is frozen. The refrigerating process is exactly like the familiar action of liquid air, carbonic acid, or ammonia gas.

The Coating of Ice about the Casing Head of This Mexican Oil Well Is Visible in the Center of the Picture. It is Caused by the Refrigerating Action of Expanding Gas

¶ Thousands of discharged soldiers and sailors are now receiving farm training through the summer courses arranged for them by practically all of the colleges of agriculture in the United States.

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## HIGH-EXPLOSIVE DETONATORS SCATTERED FOR SAFETY

Storing high-explosive detonators in small quantities at scattered points, instead of placing them in a single magazine, is the method used at naval stations to lessen the danger of disastrous explosions. A few caps are placed in each of a number of boxes hung on the walls of offices, barracks, and other buildings. The boxes are painted a bright red, and labeled to prevent tampering. Should the contents of one of the boxes explode, it would do no serious harm.

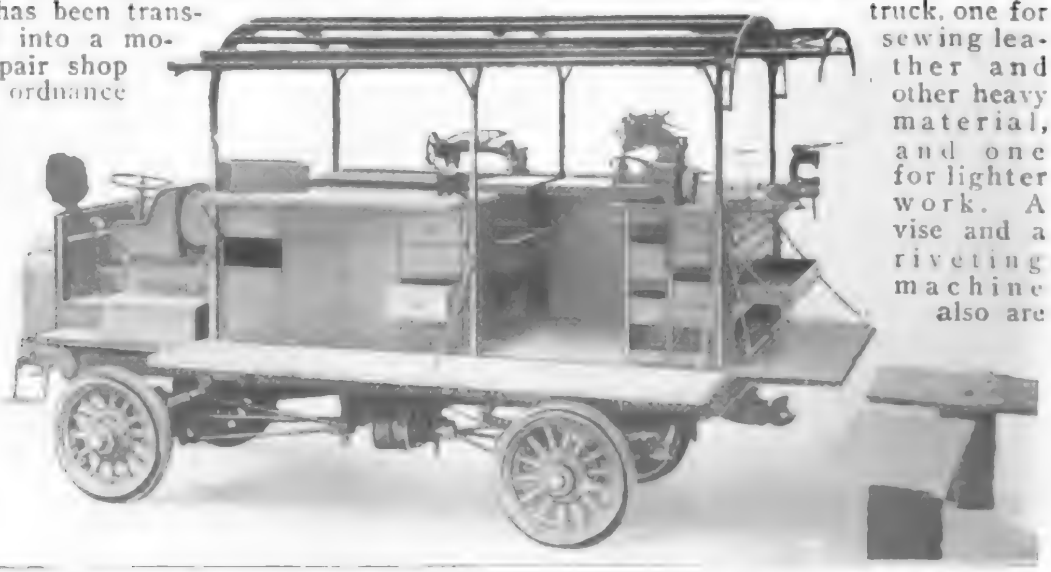
One of the Boxes in Which are Stored a Few of the Detonators Constituting a Naval Station's Supply is Shown Hanging on the Wall behind the Officer

## UNUSUAL HOT-WATER SYSTEM FOR HEATING TOWN HALL

The town hall in a large city of central Europe is being heated with hot water piped from an electric-light plant half a mile away. Live steam at 648° F. and 28-lb. pressure is used to heat the water to 275° F. At this high temperature a pipe only seven inches in diameter is adequate. The return pipe is of the same size, and a third pipe is installed as an emergency reserve for either delivery or return. The pipes are laid in a concrete subway, each with a two-inch coat of insulation, and the waste space is utilized for electric wires. At the radiators, the superheated water is tempered to 194° by pumping in a percentage of cooler water from the return pipe. The temperature of each part of the building is registered and controlled at the engine room.

## COMPLETELY EQUIPPED SHOP CARRIED ON ARMY TRUCK

For making repairs to the ordnance equipment of soldiers in the field, an army truck has been transformed into a mobile repair shop by the ordnance corps. Among other equipment, there are two power machines mounted on the truck, one for sewing leather and other heavy material, and one for lighter work. A vise and a riveting machine also are



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Many Stationary Repair Shops Have Not as Much Equipment as This One on Wheels. Two Machines, a Vise, a Riveter, and Many Drawers and Bins Are Features

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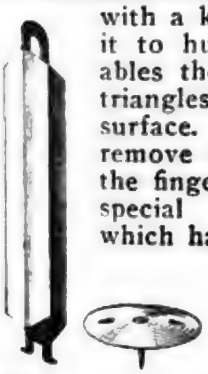
provided. Drawers and bins hold tools and supplies. The sides and end of the body of the truck are hinged to allow lowering to a level with the floor, thus giving workmen more room.

## LARGEST MOVING PICTURES SET DISTANCE RECORD

Two moving-picture records were broken recently, it has been asserted, at the centenary celebration of the Methodist church in Columbus, Ohio. An ordinary projecting machine, equipped with a special lens, a special, rapid shutter, and a 150-ampere light, was used to throw pictures, 100 ft. by 75 ft., on a screen 350 ft. away from the machine. These are believed to be the largest animated pictures ever shown, and the distance they were projected also is said to establish a record. The light employed was three times the strength of those commonly used. It generated so much heat that it was necessary to operate the cinematograph at great speed to prevent burning the film. The screen on which the pictures were thrown was 115 ft. square.

## NEW THUMB TACK AND LIFTER AID IN DRAFTING

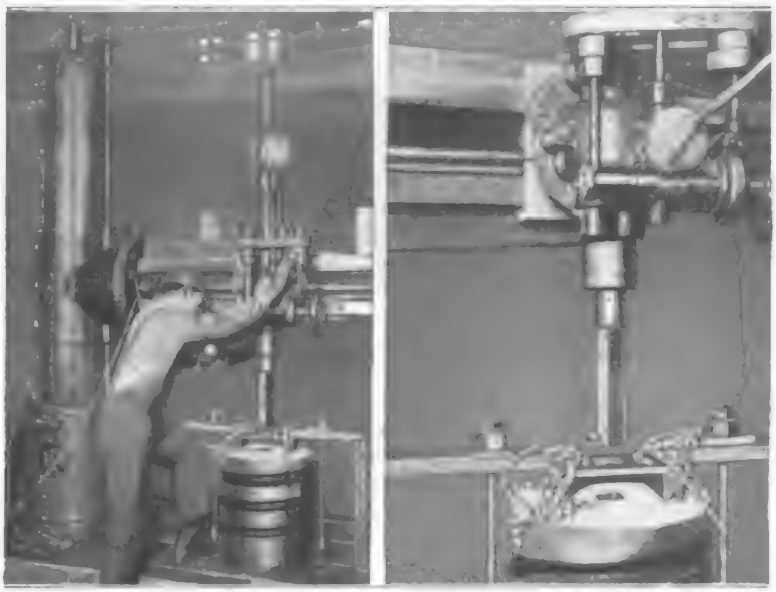
An improved thumb tack for the use of draftsmen has a head that is provided with a knife-edge, which permits it to hug the paper. This enables the T-square and drawing triangles to slide easily over the surface. It is not necessary to remove these tacks by inserting the finger nail under the edge, a special lifter being provided, which has two spring claws that fit in holes in the top of the tacks.



¶ Flies caught in traps owned by the city at Redlands, Calif., are sold to a near-by fish hatchery as fish food. Trucks carry millions of them to the hatchery daily.

## IMPROVED FORM OF DRILL CUTS SQUARE HOLES

Added to the growing collection of odd tools is a new form of square-hole drill, devised by the superintendent of an eastern shipyard's machine shop. The drill itself is triangular in shape, with its sides hollowed out to give three cutting edges. While the drill is revolving, its axis is made to travel in an orbit whose course is elliptical. This movement is not now automatic, but could, the inventor declares, readily be made so if quantity production made it desirable. The drill cuts a clean and accurate square hole, which needs no subsequent tooling, even in the corners. While used so far only for three-inch holes, it is stated that a six or even eight-inch cut is within its capacity.



At the Left the Square-Hole Drill is Seen Working in a Press, the Close-Up View at the Right Showing How It Operates through a Guide, Which Steadies the Orbital Motion Imparted by the Chuck

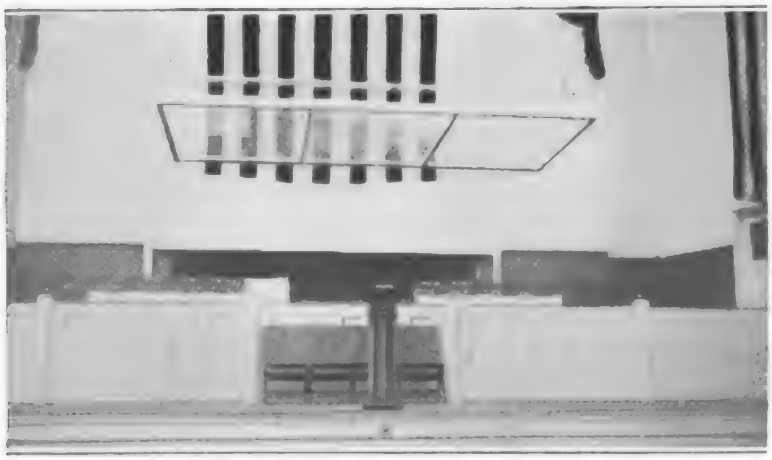
## NAVY PLANS GIGANTIC AIRSHIP HANGAR FOR ATLANTIC COAST

The secretary of the navy has approved plans for the erection at Lakehurst, N. J., of a tremendous dirigible hangar, to be of steel throughout, and 800 ft. long, 265 ft. wide, and 174 ft. high, with provision for additional sections as required. The designers are evidently looking far into the future, as a shed of these dimensions will shelter a dirigible of 10,000,000-cu.-ft. gas capacity. It will be remembered that the transatlantic dirigible "R-34" holds 2,000,000 cu. ft., or only one-fifth as much.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

## USE GLASS SOUNDING BOARD IN CHURCH AUDITORIUM

Plate glass was used in the construction of a sounding board that has improved the acoustic properties of a Detroit church. Three panes of heavy glass are set in an oblong frame of steel, which is attached to a wooden pole by wires from its corners, and suspended over the pulpit by cables fastened at either end of the pole. The cables pass through pulleys on the ceiling, permitting the contrivance to be raised or lowered to suit different speakers or conditions. The frame and pole are painted to harmonize with the woodwork of the room.



A Sounding Board of Plate Glass That is Used in a Detroit Church: Three Heavy Panes, Set in a Steel Frame, are Suspended over the Pulpit, and Throw the Voice of a Speaker to All Parts of the Room

## MOVE TO PERPETUATE PUBLIC USE OF NAVAL WIRELESS

Use of the Navy Department's wireless system for commercial purposes is proposed in a bill introduced by the secretary of the navy. The emergency legislation which has temporarily allowed such use is about to expire. The government's vast radio facilities, supplementing the already overcrowded cables, would prove a tremendous business asset to the country in the building up of foreign trade. The navy has eight transmitting and receiving stations on the Pacific coast, four on the Atlantic, two in the Hawaiian Islands, and one each in the Philippines and Guam. The range of the system is from Italy and all of western Europe to China and eastern Siberia, working directly with the high-power stations in foreign countries.

## COAL-MINE WINDING MACHINE HAS INTERESTING CONTROL

Electrical winding machinery recently installed for operating the cage of a large English coal mine has some control features of marked interest. The 370-hp. alternating-current motor, driving the 15-ft. drum through a 10-ft. spur gear, is controlled by a liquid rheostat through which electrolyte flows continuously. Resistance is changed by raising or lowering a sluice gate, the gradual replenishing of the liquid when the gate is raised assuring a safe rate of acceleration for the motor. A small direct-current generator, chain-driven from the motor shaft, operates a relay through step-by-step resistances if the drum accelerates too fast, and throws the main circuit breaker, stopping the machine.

## MINIATURE CASTLE CARVED FROM SOFT SANDSTONE

Carved from soft sandstone, a miniature medieval castle on a California beach faithfully represents a feudal fortress on a small scale. The model building stands on a diminutive hill that strikingly resembles the precipitous elevations upon which such strongholds usually were built. Several styles of architecture are to be seen in the small castle, which was fashioned on a scale of ¼ in. to 1 ft. by a mechanical engineer who spent his leisure moments on the task.

Miniature Medieval Castle, Carved in Sandstone on a California Beach: The Watch at the Bottom of One of the Towers Indicates the Model's Size

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Tilting Hoppers for Railroad Gondolas: One is Shown Delivering Gravel into a Motor Truck, While That at the Left is Filled and Ready for Dumping. The Hoppers Are Removable

## TILTING HOPPERS ON CARS LOAD TRUCKS RAPIDLY

Tilting hoppers attached to the edges of railroad gondolas are used in some parts of the West to expedite the transfer of gravel from the cars to motor trucks. The hoppers are filled with hand shovels and dumped into the truck bodies when the machines are driven alongside the track. This method prevents loss of time by providing loads for trucks as soon as they arrive at the cars. When a car has been emptied, the hoppers can be removed and fastened to one that is filled.

## SWAMPS IMPEDE BUILDERS OF CONCRETE AQUEDUCT

Many difficulties were encountered by the builders of a recently completed concrete aqueduct from Shoal Lake to Winnipeg, Canada, a distance of 97 miles through territory consisting largely of swamps. At some points the ground was so soggy that the ditch, which was dug to receive the enormous pipe, would cave in if excavated material was placed near the edge of the cut. In such cases, two excavating machines were used, one for digging and the other for picking up excavated material and depositing it at a distance from the ditch. Where the water-soaked soil in the bottom of the cut was found too soft to bear the weight of the aqueduct, piles were driven through it, to a more solid stratum, and cut off close to the surface to provide a firm foundation.

¶The Canadian Air Board prohibited trick, exhibition, or low flying over city areas just a few days before the Chicago dirigible disaster.

## COMBINED DOOR AND LADDER LATEST SILO IMPROVEMENT

Greater speed in feeding, better and more certain ventilation, and increased ease of operation are advantages of a silo door recently put on the market, according to its manufacturers. Each door is of standard size and swings on two heavy, malleable-iron hinges, shaped so as to clear the door by 7 in. and set 15 in. apart. These form a ladder, up which the farmer may climb to open any section or sections. Opening is accomplished by one simple operation. A rigid frame and a positive-locking device makes the door air-tight when closed. The ladder is particularly valuable in cold weather, when ice makes the ordinary type extremely dangerous.

Opening a Section of the Combination Silo Door and Ladder

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When There Is No Snow on the Ground, an Alaskan Hitches His Dog Team to This Wheel-Mounted Sled and Rides on Rubber Tires. The Sled Is One of the Type Used by Indians

## WHEEL-MOUNTED DOG SLED USED BY ALASKAN

Snow and ice are not perpetual in Alaska, popular belief to the contrary, and while dog sleds are commonly used during the colder months, they are of no value in the summer, when the ground lacks its covering of white. This latter fact led a resident of the territory to invent a conveyance to be drawn by his dog team during the warm season. A sled of Indian design was mounted on four small bicycle wheels, and a steering column and wheel from an automobile were connected to the front pair. Five dogs, hitched in the usual manner, draw the wheel-mounted sled.

## SEAPLANE TAKES REPAIRMEN TO MEND BROKEN WIRE

A seaplane was used in the Panama Canal Zone recently to take repairmen to the scene of a break in a telegraph line on the isthmus. This swift means of travel made it possible to resume communication in a brief time. Carrying two army officers, the plane flew from Balboa, near the city of Panama, to San Carlos, a town 50 miles away, in 45 minutes. The officers located the broken wire in San Carlos, mended it, and then returned to Balboa in 40 minutes. It would have required three days to make the trip in the usual way, which is by horse.

## WATER EXCAVATES RESERVOIR AND CARRIES AWAY DIRT

Directed by man, water is digging a large reservoir in Kansas City, and besides is carrying away the earth excavated and with it filling a small lake that is considered undesirable. The site of the reservoir is in a municipal park near the edge of a high cliff, at the base of which is the lake. Streams from two 3-in. fire hose are played, 24 hours a day, on the area set aside for the reservoir, and the material loosened in this manner is carried suspended in the water to the lake by a 6-in. pipe. By using this method, the contractor doing the work avoids damaging the improved roads in the vicinity by heavy hauling, which would be necessary if the excavated dirt were taken away in wagons. The lake which is being filled has been the scene of numerous suicides.

Hydraulic Excavating: Streams of Water from Fire Hose were Played on the Site of a Reservoir as Shown in the Two Pictures on the Right. On the Left Is the Lake Which is Being Filled with Excavated Material

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# CURVED BACKGROUND FOR STUFFED-BIRD PICTURES

Many of the most educative and striking bird pictures are made by photographing stuffed birds against a cleverly painted, curved background. Museums of natural history use habitat pictures made in this manner, in many instances finding them more satisfactory than those from life itself. The foundation for the background is formed by a large canvas painting, curved back sharply at the ends, so that the group will photograph in proper perspective. Carefully assembled before the painting are shrubs, grasses, mosses, or other growths, all selected only after study of the flora peculiar to the region represented. Thus any number of birds may be shown in any desired positions, and amid surroundings that are both true to nature and ingeniously disposed to display the specimens to best advantage. In this way the settings seem more satisfactory than nature, giving the student time for unhurried inspection, and rewarding the photographer with excellent nature pictures.

An Egret Rookery from South Carolina: The Curved Background Is Responsible Here, Again, for the Perfect Perspective of the Picture

By Skillfully Blending the Objects of the Foreground with the Curved, Painted Background, This Stuffed "Road Runner" from Arizona is Given a Setting That Rivals Nature. The Curved Background Is Largely Responsible for the Illusion of Reality

## MAKE CELLULOSE SUBSTITUTE FROM TREATED GELATIN

A new French process of treating gelatin, or glue, produces a substance with all the plastic and coloring properties of the widely used cellulose products, but entirely noninflammable and odorless. The gelatin, or glue, is melted in a water bath at 194° F., and to it is added a mixture of hop-flower decoction and oxalic acid, which precipitates impurities and gives flexibility to the material. It is then dried in sticks or sheets, dyed any color desired, and soaked in a solution of formaldehyde, alcohol, water, oxalic acid, tannin, and glycerin. After drying in hot air, it is ready to be worked into articles of imitation ivory, tortoise shell, horn, or amber.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

This Wire Caging Supplants the Old-Fashioned Scarecrow in Keeping the Birds from a New Species of Wheat Developed at a Government Experiment Farm. Bred from a Hardy Siberian Species and a Luxurious American Strain, This Crossbred Wheat Is Typical of the Made-to-Order Products of the Farm. Such Work Promises to Save the American Farmer Millions Each Year

# CROSSBRED FRUITS AND GRAINS DISEASE-PROOF

By ROBERT H. MOULTON

IN Alexandria County, Va., across the Potomac from Washington, is located a 400-acre government experiment farm where many wonderful things are being accomplished. It is one of the largest highly specialized farms in the world and is operated by the Bureau of Plant Industry of the Department of Agriculture. The latest thing to draw attention to this farm is the announcements, by the scientists working there, that there has been discovered, or rather produced through crossbreeding, a wilt-proof tomato. This is of great importance, because, be it known, there is a mysterious disease called tomato wilt, which has done untold damage in regions where tomatoes are specially cultivated. The toll from this disease in Georgia last year was 50 per cent of the crop, while Virginia's and Maryland's crops were cut by 10,000 and 25,000 tons, respectively.

At the government farm, however, there was a field of tomatoes which defied every attack by the wilt. The plants in this field were repeatedly subjected to contact with diseased plants brought from other parts of the country for that purpose, and not one of them was affected in the slightest. From this field, therefore, was gathered a goodly supply of tomato seeds which will be sent to all the principal tomato-growing sections. The result, it is confidently predicted, will be the ultimate eradication of the disease and the consequent saving of millions of dollars to the tomato growers of the country.

Sometimes the scientists at the experiment farm can find a cure for a plant disease. If they cannot, they seek a plant which will resist the disease, and then, through the mixing of varieties, evolve a seed which will produce bountifully and at the same time be immune to the disease. This was the case with the tomato experiments. Cures were sought for the tomato wilt. This involved a long and exact process, for the wilt germ first had to be isolated and then efforts made to control it by chemical sprays. As these efforts were not successful, search was begun for a plant that would resist the disease. After a long time such a plant was found.

This plant, however, yielded but a single scrawny tomato, which had nothing to recommend it but a magnificent constitution. Therefore it was decided to mate the hardy but otherwise unprepossessing tomato to an aristocrat of the same family from another section, noted for its prolific yield. This was done, and after several years of progressive experimenting with the progeny of this, the wilt-proof tomato has been evolved.

Another promising example of crossbreeding is that of a variety of Siberian wheat with a strain from our own West. The Siberian wheat possessed the quality of superb vigor, built up through centuries of resistance to extreme cold, and the western beauty that of abundance but the disadvantage of susceptibility to cold. Through this experiment it is expected that there will be evolved a new wheat which will combine the best qualities of both parent wheats.

While all this sounds simple enough, it is in reality a long, tedious, and usually costly process. In the case of the two



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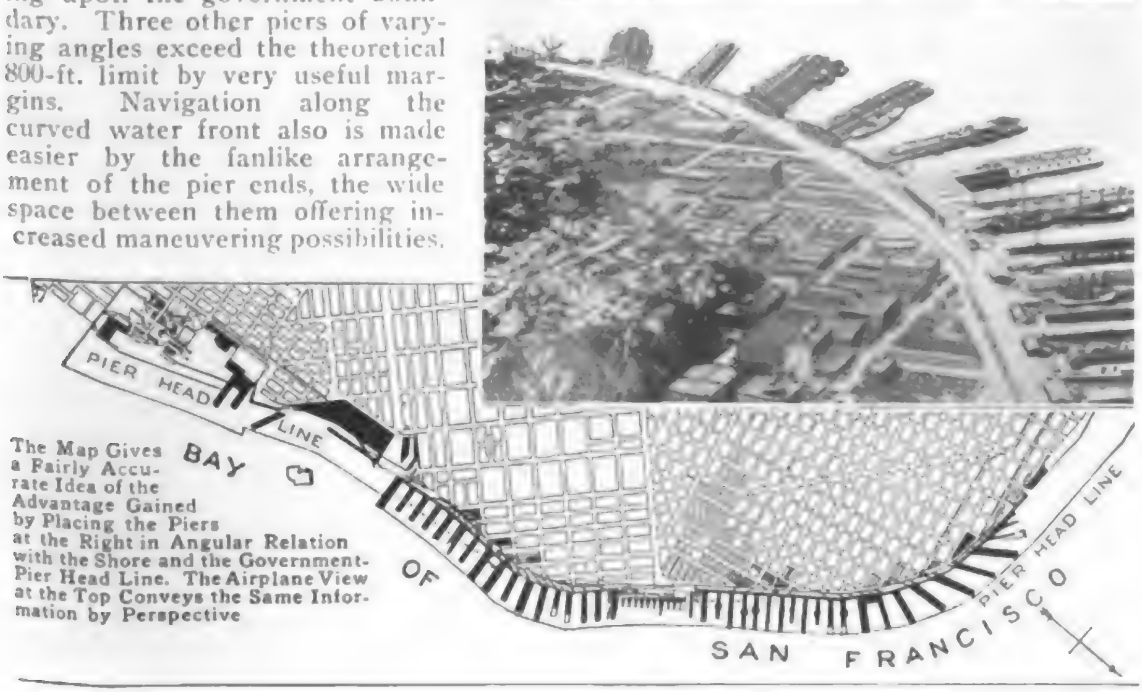
wheats, the expense of mating, including the succeeding tests, has amounted to $10,000. Of course, this price will be cheap enough if the final results are as anticipated. The progeny of the Siberian and western wheats is considered so valuable that, during the growing season, it is placed in a cage for protection from birds. The cage is of wire netting, with a headroom of eight feet, so that the cultivator can move about.

Some idea of the huge amount of work carried on at the experiment farm may be gained from the fact that there are over 1,500 different grain seeds being experimented with, while the variety of fruits, flowers, and vegetables is almost as numerous.

## SHIP PIERS AT AN ANGLE SOLVE SPACE PROBLEM

A growing problem of the San Francisco water front is the location of the government-pier head line, only 800 ft. from the sea wall. Adequate docking facilities for modern ocean traffic demand piers at least 1,000 ft. long. So far as new piers are concerned, the harbor commission has solved the puzzle by building them at an angle to the sea wall. One of these structures, projecting at 45°, attains on its outer side a length of 1,082 ft., with a width of 200 ft., while its inner and shorter side is 882 ft. long, without in the least encroaching upon the government boundary. Three other piers of varying angles exceed the theoretical 800-ft. limit by very useful margins. Navigation along the curved water front also is made easier by the fanlike arrangement of the pier ends, the wide space between them offering increased maneuvering possibilities.




The Map Gives a Fairly Accurate Idea of the Advantage Gained by Placing the Piers at the Right in Angular Relation with the Shore and the Government-Pier Head Line. The Airplane View at the Top Conveys the Same Information by Perspective

## OAK TREES ARE MONUMENT TO SEVEN BROTHERS

Seven stately oak trees, growing so close together that their trunks seem to merge into a single butt, are pointed out to travelers in Louisiana as a memorial of seven brothers who planted the acorns from which they grew. The planting was done just before the Civil War, and each seed produced a strong and healthy tree. Festoons of moss on the branches of the trees add to the picturesque appearance of the group.

Seven Acorns, Planted by As Many Brothers Just before the Civil War, Produced This Beautiful Group of Oak Trees in Louisiana. Each Acorn Was the Seed of a Strong, Healthy Tree, a Monument to Its Planter

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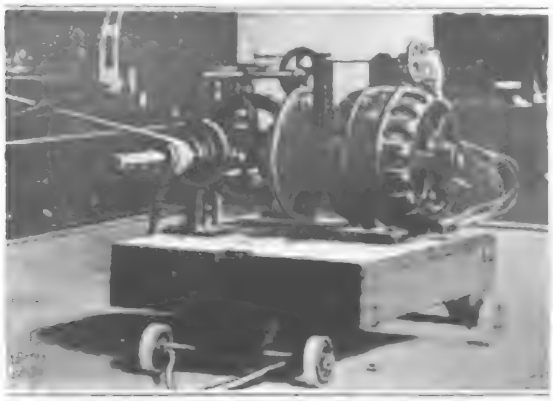
## POWER PLANT ROLLS TO ANY PART OF MACHINE SHOP

For use in the laboratories of a technological school, a portable power plant has been developed that should recommend itself to many machine shops. Mounted on four iron wheels, the base or platform supports a 7-hp. motor with a friction transmission and a drive pulley. The apparatus rolls easily to any part of the laboratories, yet is so compact and heavy that it keeps its place regardless of the speed developed. The friction transmission gives easy control of the speed.



This Electric Power Plant may be Rolled to Any Part of the Shop on Its Iron Wheels. The Friction Transmission Varies the Speed as Desired

## WILD FLOWERS BEAUTIFY CITY'S VACANT LOTS

Weed-covered vacant lots were converted into spots of beauty in a western city by the simple means of destroying the offending vegetation and sowing wild-flower seed in the unsightly areas. A man possessed of considerable civic pride started the work, which later was taken up on a larger scale by a men's club. Signs were erected on the beautified lots, requesting the public not to pick the flowers, and pointing out the economy and value of the scheme.

Vacant Lots in a Western City were Beautified by Sowing Them to Wild Flowers. Signs Request the Public Not to Pick the Posies

## LONG-DISTANCE GUNS SHOWN TO LACK PRACTICAL VALUE

One of the things the United States did not develop during the war, and has no intention of developing now or in the future, is a long-distance gun. That the 75-mile German cannon that bombarded Paris could readily be surpassed, merely as a matter of engineering, has been demonstrated by the Ordnance Department with a set of interesting but wholly experimental figures, which never, in all probability, will be put to practical use. The theoretical gun is 225 ft. long, burns 1,440 lb. of powder, and throws a 500-lb. shell 121 miles. As the present length limit of forging is 70 ft., the hypothetical 225-ft. barrel would demand a radical increase in size of all steel-making equipment, from the furnaces to the lathes, already of giant dimensions. The barrel might, of course, be made in sections; but erosion troubles would undoubtedly manifest themselves, as the breech portion would be exposed to high temperatures for considerably longer periods. Such a gun would cost some $2,500,000, and its life would be short. The department's figures have their greatest value in proving that the long-distance gun is an impractical, extravagant, and useless engine.

## EXPLAINS VOLCANIC VAPORS OF GREAT SMOKE VALLEY

Since the discovery of the Valley of Ten Thousand Smokes in Alaska, various theories have been advanced to explain the nature of the myriad emanations from the valley floor. A scientist attached to the exploration party disposes of the idea that steam from superheated drainage water is the cause, by pointing out the acid and metallic composition of the vapors. He considers the activity due to total decomposition of the water contained in the crust, and the subsequent reaction of the evolved oxygen and hydrogen upon the molten interior mass of the earth at extreme temperatures. The fissures through which the vapors escape were caused by the eruption, in 1912, of Mount Katmai.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## TREE-SPRAYING APPARATUS TOURS BIG TERRITORY

One of the developments of the fight against tree pests is a mobile power sprayer that is touring the middle West, working in certain localities only so long as its services are demanded, then moving to another field. The apparatus is mounted on the chassis of a stock model one-ton truck, and consists of a 385-gal. wooden tank for carrying spraying mixture; a pressure pump, driven by a gasoline engine; hose, spraying nozzles, and ladders, the latter for use when unusually tall trees are to be treated. A roof shelters the pump and engine, which are located behind the tank. Curtains, which are rolled down when the sprayer is on the road, to exclude dust, or in bad weather, further protect the mechanism. With 150 lb. of pressure, spraying mixtures can be thrown to a height of 56 ft. by an operator standing on the ground, while much greater heights can be reached by using ladders. A solution containing arsenate of lead is used in the sprayer in warm weather, and one made with lime and sulphur in cold weather.

**Mobile Tree Sprayer That is Touring the Middle West: The Tank Holds 385 Gallons of Spraying Mixture. A Gasoline Engine Drives the Pressure Pump. All of the Apparatus is Mounted on a One-Ton Truck**

## ELEVATOR LIFTS PASSENGER COACHES FROM TRUCKS

For lifting heavy passenger coaches straight up off their trucks, a hoisting machine was recently installed at a large western car plant. The hoist consists of four huge screw jacks, two at each side of the track, the pair at one end being movable to accommodate cars of different length. The sills of the coach rest on brackets which project from the track side of vertical posts. The screws are operated in unison by electric motor, keeping the car body level at all elevations.

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**Heavy Passenger-Coach Body Lifted Clear of Its Trucks by the Four Stationary Jacks, Which Operate in Unison by Electric Drive**

The Jacks Slide in Vertical Posts, the Brackets on Their Inner Sides Engaging the Sills of the Coach, Which is Thus **Kept Level**

Motor Street Flusher and Sprinkler: The Mammoth Tank is Carried on a Detachable Trailer. On the Left, the Flushing Nozzles are Shown in Operation; at the Right, the Reservoir is Receiving a Supply of Water from a Hydrant

## METAL-CHUTE FIRE ESCAPE USED AT INFANTS' HOME

Fire drill at an infants' home in Portland, Ore., is an exciting and pleasurable occasion for the youthful inmates.

Babies in an Infants' Home in Portland, Oregon, are Safeguarded by This Novel Fire Escape, a Zinc-Lined Chute Extending from a Second-Story Window to the Ground. The Picture Shows the Inmates and Their Attendants Enjoying a Fire Drill

An explanation of this lies in the unusual fire escape which is installed there. This is a zinc-lined chute, extending along the side of the building from a second-story window to the ground. Children old enough to sit up are allowed to slide, feet first, down the polished trough, and are caught at the bottom by an attendant. Smaller babies make the swift journey in the arms of nurses.

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¶A course in jewelry designing has been added to the list of subjects taught in the public schools of Cincinnati. Instruction will be given by an Italian who studied the art in France.

## TANK OF MOTOR SPRINKLER CARRIED ON TRAILER

Advantages claimed for a motor street flusher and sprinkler which has its tank mounted on a detachable trailer are that it has a greater water capacity than the ordinary machine of this type, and that the five-ton hauling truck can be used for other purposes if the trailer is removed. The tank holds 2,000 gal. of water. It can be filled from a street hydrant in six minutes, and emptied in four minutes. A pressure of 40 lb. to the square inch is created by the weight of the water when the tank is filled. Levers near the driver's seat control the flow of water through the nozzles, two of which are flat for flushing, and two round for sprinkling. All four of the nozzles are located in front of the radiator.

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## GERMANY PLANS ZEPPELIN SERVICE TO AMERICA

Although the treaty of peace with Germany calls for the surrender of all her dirigibles, a notice recently appeared in several New York newspapers advertising Zeppelin service between Duesseldorf-Berlin-Hamburg and New York-Boston-Chicago. Bookings for freight and passenger shipments were to be received after September 18, the first flight to be made a month later. It is believed, however, that the U. S. government will forbid the traffic, planned for years as a factor in Germany's post-war commercial offensive.

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## RESERVOIRS FOR NILE RIVER PROPOSED BY ENGINEERS

Engineers are studying the upper Nile River and its tributaries with the hope of evolving a practical plan for controlling the flow of water in that part of the great African stream. The problem is

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considered to be one of the most difficult ever attempted, because of the length of the drainage basin and the peculiar conditions existing in the region where it is proposed to begin operations.

Because of the almost level channels of the White Nile and of the Lake Albert Nile, upstream from Khartum, these sluggish rivers are dammed by their swifter tributaries when the latter are in flood. Among these tributaries are the Blue Nile and the Sobat River. When the White Nile and the Lake Albert Nile are checked in this manner, their waters overflow into the flat lowlands alongside the streams, and remain there until they are lost by evaporation and absorption. The object of irrigation experts is to return this water to the river channels from which it came, when it is needed to maintain a steady flow downstream.

One of the projects being considered provides for the construction of extensive reservoirs along the Zaref River, a tributary of the Lake Albert Nile, and along the latter stream also, to receive the ponded water and return it to the river beds when downstream conditions become normal. By carrying out such a plan, a large area of land would be made available for agricultural purposes.

## GARAGE BUILT OF ELEVATORS STORES AUTOS IN TIERS

The problem of caring for many autos in a limited ground space is solved by an Oregon designer, with a garage containing as many floors as an office building. The building is practically made up of banks of elevators, and each elevator likewise has many stories, or tiers of cells. The floor of each compartment slopes toward the rear, so that the car is safely retained in its stall, and any drippings of oil or gasoline are caught in a trough and piped away to protect the car below. By using hydraulic elevators, the tops of which are clear of obstructions, the entire garage floor space may consist of elevators, giving as much storage area as circumstances warrant. The method, while expensive, is declared to be really economical for locations of high ground value.

Garage of Many Stories, Made Up of Multiple-Tier Elevators in Which the Cars are Stored: Each Compartment Floor Slopes Back to Retain the Car, and Drainage Troughs Protect Lower Cars from Possible Dripping of Oil or Gasoline from Those Above. When the Hydraulic Elevators Are Down, Their Flat, Unobstructed Tops Make a Floor

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¶ Dough mixed with sea water produces bread which remains fresh longer than that made with fresh water, it has been discovered by a French scientist, who recommends the food as suitable for invalids and children. Water should be obtained some distance from land, and drawn from some depth.

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## PROFITABLE MINE LOCATED WITH HOMEMADE DRILL

That the resourcefulness of the trained mechanic, spurred by necessity or ambition, is equal to almost any demand is indicated by the experience of a Kansas farmer, who had formerly been employed in a Pennsylvania prospecting-drill factory. His farm was located in a mining district, and lead and zinc ore had been found within 50 ft. of its boundary fences. The farmer, unable either to interest his neighbors in a coöperative venture, or to employ a driller to sink three or four 200-ft. holes at $1.50 a foot, set out to rig up his own drill. An old, but serviceable boiler, and the parts of a wrecked tractor supplied all the mechanical needs, secondhand mine timbers built a good tower, and a discarded cable made a rope for the drill points, which latter were the only items purchased new. This improvised equipment, representing an investment of $260 for materials and hired labor, struck "pay dirt" at the first boring. Its task thus completed, it was immediately rented out to the converted neighbors for enough to pay the cost of sinking a shaft, plus $2,000 profit. After three months the shaft had yielded some $2,500 worth of ore—and the homemade drill is still working.

**Prospect Drill Made from Parts of a Junked Tractor and Secondhand Boiler, Timbers, and Cable, Which Struck Ore in the First Hole It Bored on a Kansas Farm**

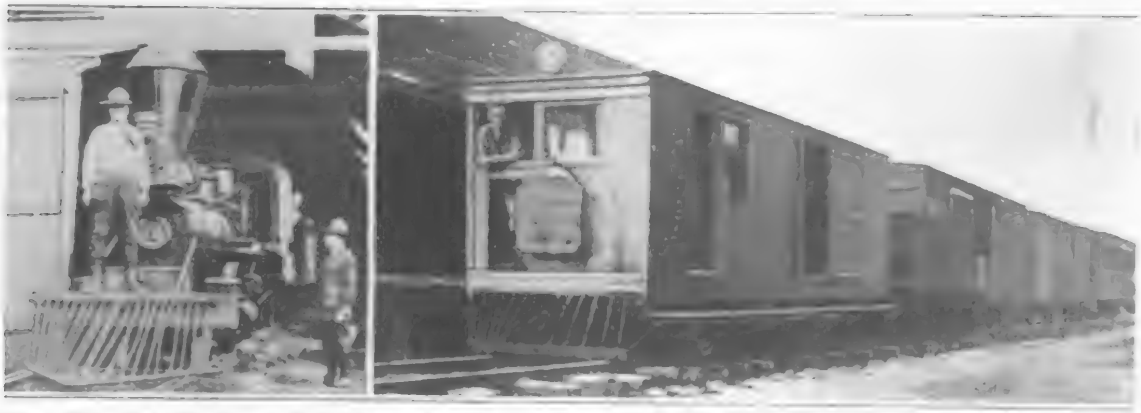
## FERTILIZING POWDER SERVES IN SPRAYING SOLUTION

Used in dry form, a dual-purpose powder recently placed on the market is valuable as a fertilizer, according to its manufacturers, who declare that it produces a satisfactory solution for spraying trees and vegetables when dissolved in cold water. The compound is said to be nonpoisonous, except to destructive insects, and to be harmless to vegetation when used either dry or in solution. It is also odorless.

## GASOLINE MOTORS SUPPLANT WOOD-BURNING ENGINES

Powerful six-cylinder automobile motors, geared to the wheels of diminutive box cars, haul trains over a 22½-mile narrow-gauge railroad which connects Brownsville, Tex., with Point Isabel, the latter a port on the Gulf of Mexico. Gasoline has entirely superseded steam on this line, the ancient wood-burning loco-

**The Mine as It Appeared Three Months After the Homemade Drill had Shown the Way to Fortune: The Ore in Sight and Ready for Sale was Estimated to be Worth $2,500, and All Expenses of Sinking the Shaft were Paid by Renting Out the Original Drill—with a Profit Besides**



**The Old and the New: One of the Antiquated Steam Locomotives Formerly Used on a Short Texas Railroad is Shown in the Smaller Picture, While Its Successor, a Swift, Gasoline-Propelled Car, Appears in the Larger**

motives formerly used having been retired several months ago, when experiments showed the more modern power plants to be superior. One great advantage of the motors is that the fuel used by them is more easily obtained in the border country than wood or coal. Quite frequently the gasoline-propelled trains attain a speed of 30 miles an hour, and at all times they run according to schedule, if the track is in proper condition. The right of way runs through low territory, which is dotted with small lakes and salt marshes, and the tracks are sometimes submerged by flood water from the Rio Grande, which flows not far away, or from the gulf on occasions when a violent storm is raging there.

## RAILROAD ACCIDENTS FEWER DURING CAMPAIGN WEEK

Interesting statistics are given in a report on the "No Accident Week" campaign conducted during seven days of June by the railroads of the northwestern and central-western regions of the United States. In the former region, 50 out of the 63 railroads in the territory had no accidents during the week. During the corresponding week of 1918 there were 481 accidents on these roads, while those of the campaign week numbered only 119. These roads operate over 52,868 miles of track. Sixty-seven railroads, having 55,000 miles of track in the central-western region, reported 98 accidents for the campaign week, compared with 456 for the same week of the previous year. Out of the total number of roads in this region, 47 had clear records for the seven days. Over 600,000 railroad employes work in the two regions.

## AIRPLANE MAKES LANDING IN BRANCHES OF TREE

The modern airplane seems to outdo the bird in looping, tailspinning, and similar stunts; yet it has previously yielded the palm to its small rival in the routine matter of alighting in a tree. Now the airplane has accomplished even that—after a fashion. The mishap occurred while an army airman was flying in the interests of a savings campaign. His engine suddenly went dead, dropping his plane into the branches, where it wedged and stuck.

**The Fortunate Airman Stands behind the Big Limb, Snapped Off by His Airplane in Making Its Unexpected Landing in the Treetop**

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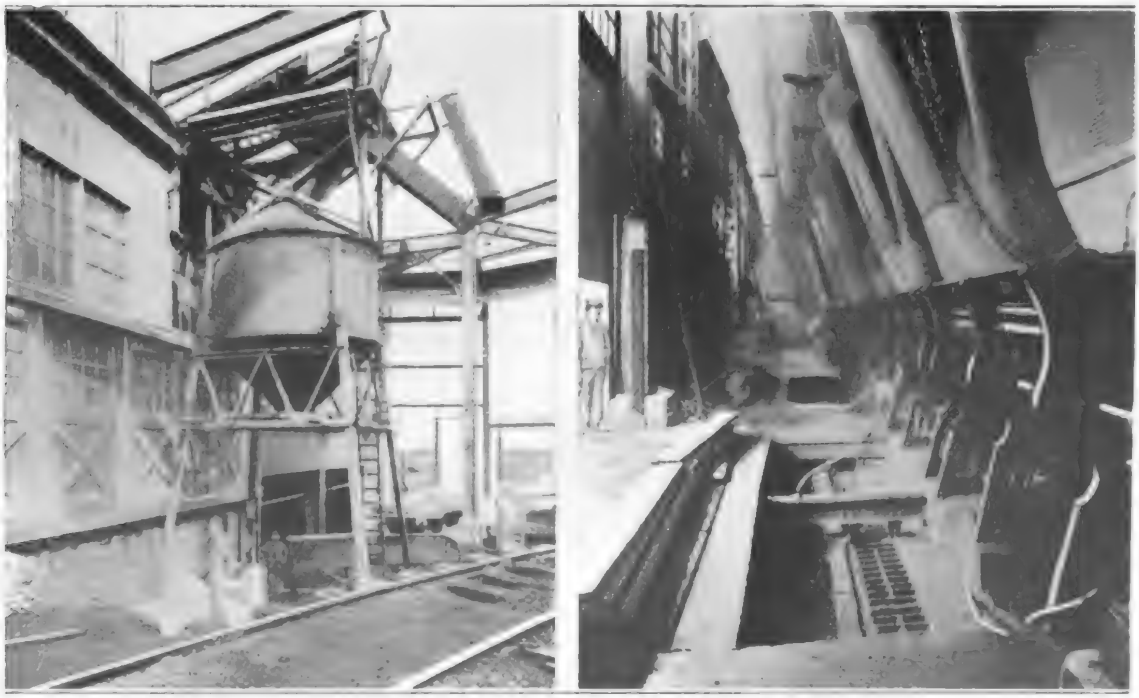
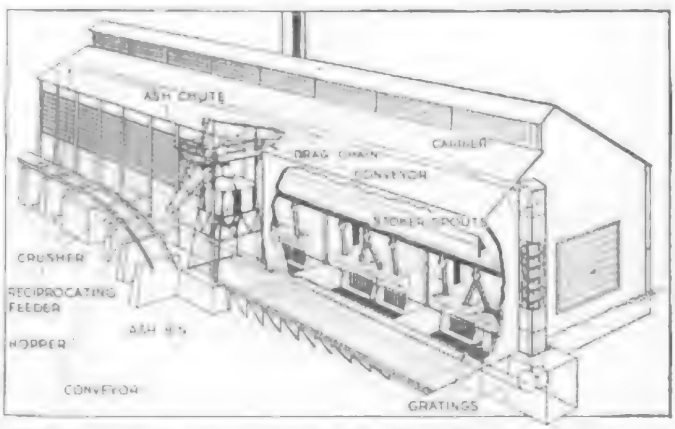


Mechanism for Handling Coal and Ashes: The Track-Side Bin for Ashes can be Seen in the Picture on the Left. At the Right are Shown the Floor Gratings through Which Material Removed from the Furnaces Drops into the Conveyor

## ENGLISH PASSENGER DIRIGIBLE WILL CRUISE TO BRAZIL

Popular interest in the projected voyage of the dirigible "R-80" from Barrow in Furness, England, to Rio de Janeiro, Brazil, and return, has lately been aroused by the sale of three round-trip tickets at $5,000 apiece. An English gentleman made the purchase, intending to take with him his wife and a friend. With the 17 other passengers they will travel in the utmost comfort, having the liberty of a large saloon, a "roof garden," a shelter deck, and private sleeping cabins, all situated in the top of the hull. The power gondolas below will drive the ship at a cruising speed of 46 miles an hour. The dirigible "R-80" is 535 ft. long.




This Drawing Illustrates in Detail How the Double-Purpose Conveyor is Installed. The Furnaces, Equipped with Stoker Spouts, can be Seen through the Opening in the Wall of the Building. Other Parts of the Device are Shown in Dotted Lines

## SINGLE MECHANISM HANDLES BOTH COAL AND ASHES

Both coal and ashes are handled by a single mechanism in a large paper mill in the East. A conveyor of the carrier type, running above a suspended coal bin and underneath grates in front of the boilers, is the most important moving part. Ashes removed from the furnaces drop through the gratings into the conveyor and are carried to a point above, where they are dumped, either into a special compartment in the coal bin, into a drag-chain conveyor that carries them to a bin outside of the building, or to a coal-loading chute. The same carrier-type conveyor handles coal, which is fed into it at the lower level after being crushed to a 4-in. size. Carried to

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the higher level, the coal is dumped into the bin, from which it is carried by spouts to the stokers.

## LAUNCHING DEVICE TESTED IN ENGLISH SHIPYARD

Metal devices to replace the wooden blocks which are used ordinarily under the keels of vessels during construction have been tested by an English shipbuilding firm, and are said to make launching a shorter and more easily accomplished operation. These cap pieces are in two parts, and are held together by a key. When the key is removed, the top portion of the contrivance can be taken off, allowing the hull to come in contact with the launching ways. With wooden cap pieces, it is necessary to cut away the top portion of the blocks, which is a long and difficult task.

## INDIAN VISITS U. S. WEARING HUGE DIAMOND ON NOSE

A few hours after a wealthy cotton manufacturer from Bombay had registered in a San Francisco hotel, with wife and retinue, curiosity reached fever heat in both kitchen and dining room. In the kitchen the cooks watched the Indian chef as, with two assistants, he prepared strange vegetable dishes. And in the dining room scarcely a woman could keep her eyes from the visitor's wife. For on her forehead she displayed the tattooed mark of her caste; and in a hole through her nose was fastened a $6,000 diamond.

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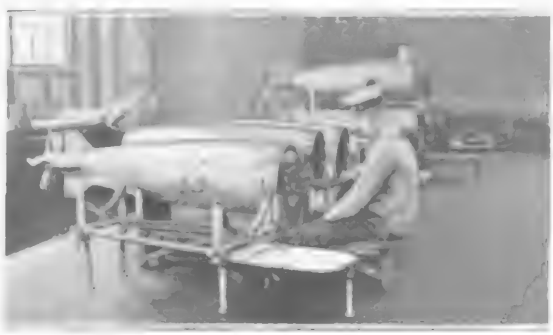
## AUTO TRUCK STEERED BY BOTH FRONT AND REAR WHEELS

The auto truck that drives from all four wheels now yields as a novelty to the truck that both drives and steers from all four. The driver is provided with two steering wheels with which he can turn front and rear wheels together or separately. For straightaway driving the rear wheels may be locked in the conventional position. Extreme maneuverability in crowded quarters is of course the merit of the new truck. It can approach a loading platform from the side, crab-fashion; the inventor even claims that it can be turned through a figure "8" within the smallest circle made by other trucks.

This Auto Truck Drives and Steers from All Four Wheels. It can Thus Approach a Platform Sidewise Like a Crab, and be Put through a Figure "8" within a Small Circle

## SPECIAL WORKBENCH SPEEDS UP TORPEDO REPAIRS

Among the time and labor-saving methods inaugurated by our navy is one which might well be imitated, in spirit, by every shop in which similar work is done. When it becomes necessary to repair the vitals of a torpedo, it is placed on a low rack, or bench, of special design. The workman sits in comfort on an attached seat, with the disabled motor directly before him. Spared the necessity of crawling around and under his job, the operator finishes his repairs quickly.



With the Disabled Torpedo Held on One of These Convenient Racks, the Navy Workman Makes His Repairs in Comfort and with Consequent Efficiency

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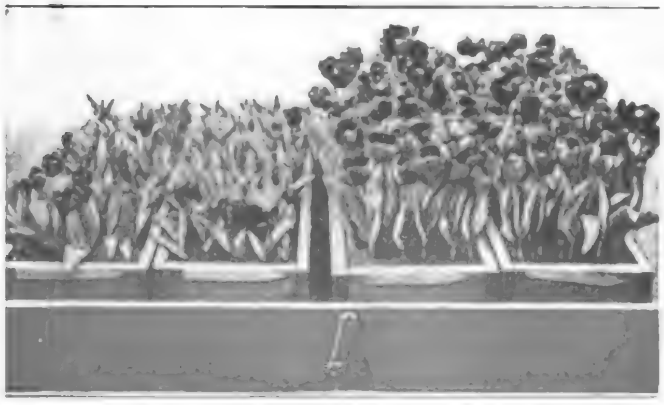
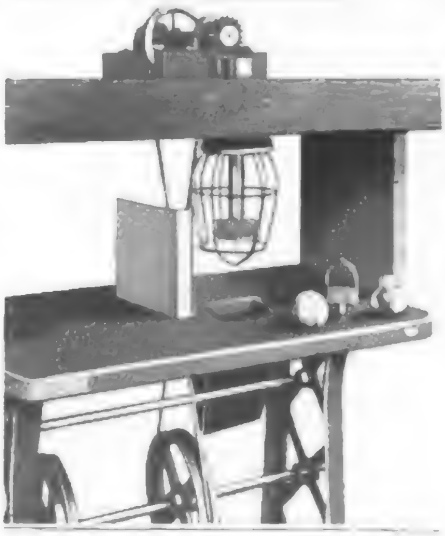
# NATIVE BULBS REPLACE IMPORTED PRODUCT IN AMERICAN GARDENS

By R. P. CRAWFORD



The Imported Plants in the Two Trays at the Left Are of Little Commercial Value, and Seem Stunted When Compared with the Tall, Healthy American Product at the Right

IN a few years America may no longer be dependent on foreign sources for its supply of flowering bulbs, such as hyacinths, narcissuses, and tulips. It is little known that Holland and a few other of the foreign countries have been shipping into the United States a million dollars or so in Dutch bulbs every year. Recently, however, the Department of Agriculture has been carrying on investigations looking to the establishment of this bulb-growing industry on American soil, and now the dreams of the hyacinth and tulip enthusiasts seem to be approaching fulfillment.

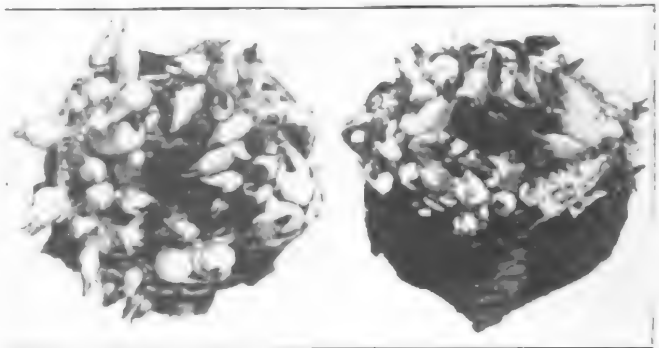


This Machine "Scoops" the Mother Bulbs by Cutting the Base, to Expose the Scales

Since 1909, the department has maintained a six-acre bulb garden at Bellingham, Wash., this location being chosen because believed to be somewhat similar in soil and climatic conditions to the Netherlands and the island of Guernsey. Production of home-grown bulbs from the imported stock has been a matter of some years, and it is only recently that the work has been brought sufficiently under way to permit public distribution of large quantities of home-grown bulbs. In the fall of 1917, however, an entire carload of bulbs was shipped east from the Bellingham gardens to be used in the congressional seed distribution, being the first carload of home-grown bulbs ever sent across the country. It was followed in 1918 by another shipment.

An interesting method of propagating hyacinths is practiced at Bellingham. It consists in "scooping" or "scoring" the bulbs, so that instead of flowering they produce a great crop of baby bulbs. "Scooping" consists in cutting the base of the bulb so as to expose the scales near their union with the base. "Scoring" is slightly different, involving two to four cuts across the base of the bulb to destroy the growing point.

In both cases the bulbs are set out in the sun for a short time to dry the surfaces, after which they are placed in a propagating house where an even summer temperature is maintained. In about four months the mother bulbs have produced a fine crop of baby bulbs and are planted with the little bulbs attached. At harvest time, in June or July, the mother bulbs have practically disappeared and in their place are found scores of these tiny bulbs.



After Four Months in the Propagating House, These Mother Bulbs have Responded to the "Scooping" Process by Growing a Number of Tiny Bulbs



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Government Gardeners at Bellingham are Seen Cultivating the Domestic Hyacinth Bulbs with Which So Much Success has been Attained

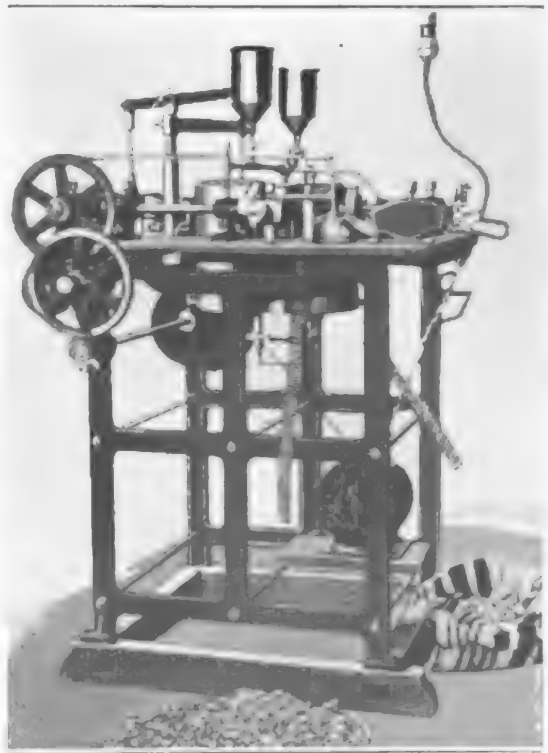
Tulip Bulbs are Here being Planted in the Furrow Beds. Due to These Government Experiments the Traditional Superiority of the Foreign Bulbs is No More

These are sorted out for further planting. At the Bellingham station a machine has been invented which is used to "scoop" the bulbs. From a total of 2,441 mother hyacinth bulbs planted there it was possible to develop by "scooping" over 55,000 new bulbs, while from 2,101 bulbs which were "scored," better than 19,000 new bulbs were produced. With these methods it takes from three to seven years to develop bulbs ready for market. With narcissuses, propagated by means of offshoots, commercial bulbs are ready for public distribution in three to five years.

Other investigations at the Bellingham station have demonstrated that narcissuses of high quality can be developed in the United States. In the case of tulips it is even asserted that the home-grown bulbs are superior to the imported. Plants grown at Bellingham were freer from disease and flowered nearly a week ahead of the imported bulbs, displaying healthier blossoms and larger stems.

## MEXICAN INVENTS MACHINE TO CAST LEAD SEALS

From bandit-infested Mexico comes an invention which is declared to be a pioneer in its field, that of casting lead seals for freight cars, express packages, and mail pouches. The machine, which is electrically operated, was devised by a resident of Monterey, and has been patented in the United States. While a somewhat complicated mechanism is used, the caster consists essentially of a pot in which lead is melted, a mold form between the ends of two slightly separated horizontal plungers, and an unusual means for transferring molten metal to the mold. The latter operation is accomplished by thrusting a displacing member into the melting pot at the moment the mold is ready to receive material. This raises the level of the molten metal and causes it to flow through a notch in the rim of the pot to the gate of the mold. As soon as the metal hardens in the mold, it is moved by the plungers to the point where it is discharged. The capacity of the machine is 1,000 seals an hour.



Invented by a Mexican, This Machine Casts 1,000 Lead Seals in an Hour. Heretofore Such Work has been Done by Hand

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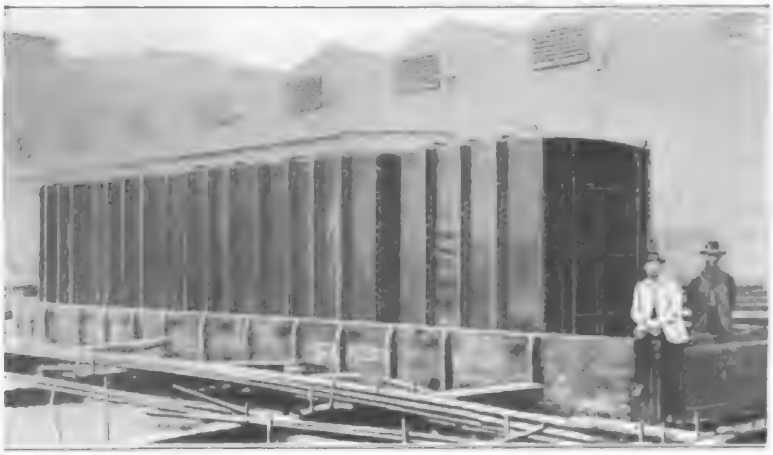
## STEEL FREIGHT CONTAINERS FOR BOATS AND CARS

Efficient utilization of freight space on cars and vessels is the chief purpose of the boxlike steel containers which are being tested on a river-boat line of the South. These are essentially large metal packing cases, each one of which is intended to serve instead of numerous boxes and barrels, which cannot be loaded without wasting room. Loading costs are expected to be reduced by their use, and the possibility of loss by leakage eliminated. Five of the containers can be placed on an ordinary flat car, and securely locked to protect the contents from damage by the elements or thieves. Each container is capable of holding 15 tons of merchandise. It is proposed to erect cranes at factories, freight depots, and docks to lift the steel boxes on and off carriers. Means are provided on the boxes for attaching hoists.



Five of the New Steel Freight Containers, Loaded on a Flat Car: The Carrying Capacity of a Train or Boat is Increased by the Use of These Metal Boxes, Which can be Securely Locked to Protect Their Contents

## SWIMMING-POOL SEDIMENT REMOVED BY CLEANER

Swimming pools need not be drained for cleaning with a device recently placed on the market. This operates in much the same manner as a vacuum cleaner. A centrifugal or rotary pump, connected by a flexible suction hose with a cleaning tool, sucks sediment-laden water from the bottom of the tank, while a brush on the cleaning tool loosens dirt that adheres. The cleaning tool is attached to the end of a long metal pipe, which serves as a handle for the operator of the contrivance, who can reach all parts of the pool while standing on the floor around it. Because of its simplicity, the device seldom requires repairs.

Cleaning a Swimming Pool with a New Device That Operates under Water in Much the Same Manner as a Vacuum Cleaner

## AIRMAN FLIES ACROSS SOUTH AMERICA AND BACK

The part the airplane is to play in uniting the scattered cities of South America was recently demonstrated by an Italian airman, member of the Italian aviation mission which is visiting Argentina. From Buenos Aires, on the east coast, he flew across broad plains and over the jagged Andes to Valparaiso on the west coast, and then to Santiago, the capital of Chile. A few days later he flew back to Buenos Aires without a stop, making the 700-odd miles in just seven hours and ten minutes. The other members of his mission rose in their planes to welcome him on his return to the eastern capital.

¶American newspapers carried by the "R-34" reached London, England, 11 days before others of the same date, sent by the ordinary steamship mail.

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# HEAVY RAINS BRING FLOODS TO NEW JERSEY CITIES

The Streets of Morristown, New Jersey, Became Raging Torrents When a Dam Broke, Releasing the Waters of a Lake Two Miles from the Town. One of the Improvised Ferries Run by the Police Carried Passengers across the Flooded Thoroughfares in an Ash Can

Swollen by the Heavy Rains Which Fell during the Latter Part of July, Streams in Northern New Jersey Overflowed Their Banks and Inundated Many Square Miles of Territory. A Scene at the Flooded Naval Rifle Range, at Caldwell, is Shown Above. Soldiers, Sailors, and Marines, to the Number of 1,500, were Driven from Their Barracks and Forced to Seek Refuge in Buildings on Higher Ground



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## GARBAGE INCINERATOR USED BY NAVY DEPARTMENT

A garbage incinerator, designed for apartment buildings or houses, is being used by the Navy Department at Washington, D. C., for destroying old code books, copies of secret orders, and other confidential matter. The burning chamber of the incinerator is located near the bottom of a brick chimney, which is somewhat enlarged at that point, to accommodate gratings. Hopper doors are provided on one or more floors for dumping refuse into the chimney, through which it falls to the burning chamber. These are constructed so that when the hopper is pulled out for receiving trash, a metal apron closes the opening in the chimney. Doors for draft regulation, firing purposes, and ash removal are placed in the wall of the burning chamber.

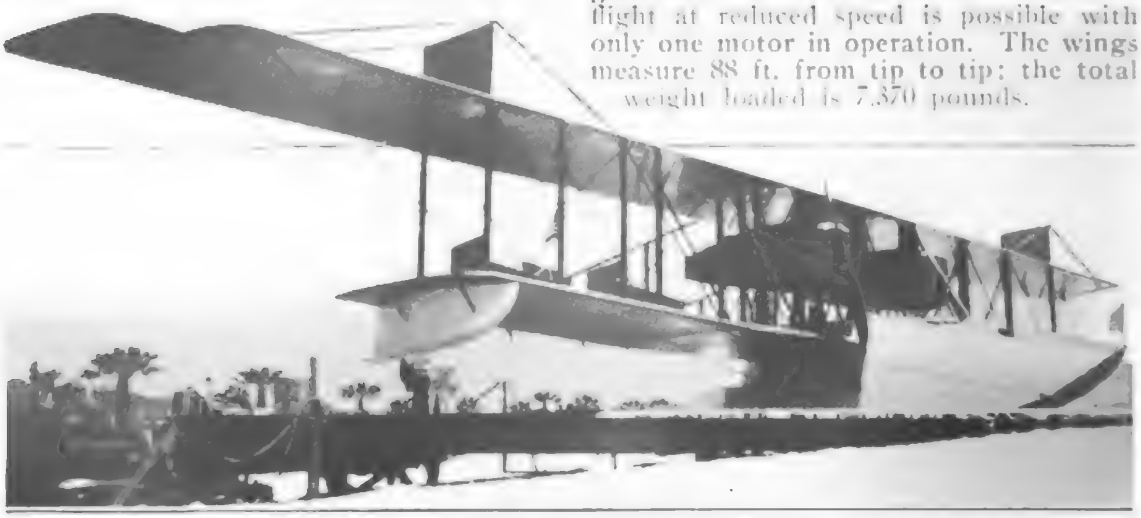
**Papers of a Confidential Nature are Destroyed by Navy Department Employes in the Incinerator to be Seen in the Center of Picture**

## METEOROLOGIST SUGGESTS ODD USE FOR SURPLUS MUNITIONS

In considering the monster accumulations of surplus war materials now stored in all corners of the earth, it must be remembered that depreciation is rapid, even in time of peace. Big-gun ammunition, in particular, deteriorates quickly, becoming dangerous to handle and uncertain in operation. So a Swiss meteorologist suggests that the big shells be used in a gigantic, unprecedented experiment, which should clarify many long-debated questions, among them the relation between detonation and rainfall. He would have the shells collected in great dumps of definite dimensions, at definite places. By exploding the shells at a stated time, the accompanying phenomena could be charted by the weather men with some approach to accuracy.

## BROTHERS BUILD BIG SEAPLANE FOR PASSENGER TRADE

Beginning their work in November, 1916, two brothers have now completed the construction of what they believe to be the world's largest seaplane designed solely for passenger carrying. The hull will seat 10 as its regular complement, but has flown easily with 18 passengers. The two motors give a speed of 80 miles an hour when carrying 10 persons and gasoline for a 450-mile cruise. Horizontal flight at reduced speed is possible with only one motor in operation. The wings measure 88 ft. from tip to tip; the total weight loaded is 7,370 pounds.



**As a Result of Three Years' Experiment and Toil, Two Brothers have Built This Large Passenger-Carrying Seaplane, Declared by a Naval Expert to Be Easier to Handle Than the Smallest of the Naval Scout Planes**

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LOAD COAL ON SHIPS BY HAND AT AMERICA'S NEWEST PORT

WHEN an American battleship is coaling up at the harbor of St. Thomas, the United States' newest island possession in the West Indies, an endless procession of negro women, each with a heavy basket poised on her head, passes up the gangplank, disappears, and presently returns with the basket empty. These sturdy workers take the place of coaling machines quite effectively; for they carry as much as 125 lb. of coal apiece, and the human chain of a hundred links or more will load 100 tons an hour. They charge one cent a basket, from the coal yard to the ship's bunkers, thereby making perhaps 50 cents a day. Charlotte Amalie, capital of St. Thomas, is a most beautiful city, a fine winter resort as well as an ideal naval base. The island was purchased from Denmark because it is one key to the Panama Canal.

## NEW PROCESS KILLS GERMS IN LIQUID FOOD WITH FIFTY-TON PRESSURE

To crush the life out of disease germs, of the kinds that inhabit milk and other liquid foods, takes a pressure of 20,000 to 100,000 lb. to the square inch. The chemical expert of a West Virginia college, in discovering this fact, found also how to apply such pressures to liquids.

For this purpose, a hydraulic press is used, with a heavy steel test cylinder, 7 in. long, 6 in. in outside diameter, and of 1¼-in. bore. A steel plug is fitted to each end of the bore, and between them a lead tube, for packing, filled with water and closed with a lead cap. In the water is placed a collapsible tin tube full of the liquid to be sterilized. While the pressure is being applied there is no leakage, although the lead packing is generally ruptured by the return to normal pressure. Instead of the collapsible tin tube, a glass vial, sealed with a wax plug, or with a collapsible tin top, is used when visual study of gas generation is desired, the movable closure acting as a piston to equalize the pressure inside and out.

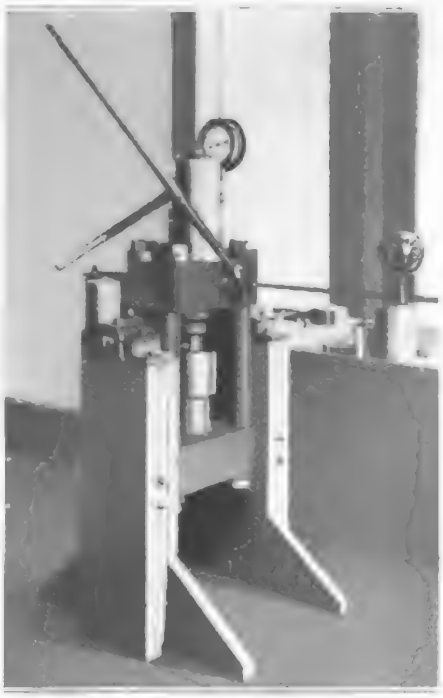

PHOTO BY GILLIAMS SERVICE

The Hydraulic Press Used for Obtaining the Enormous Pressures of the Test, with the Heavy Steel Cylinder in Place

With this apparatus, it is found that the maleficent bacteria in milk are wholly destroyed by pressures considerably lower than 100,000 lb., while the beneficent enzymes are unaffected, as the pressure is applied at normal temperatures. For much of this work

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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Boring, Slotting and Milling Machine.

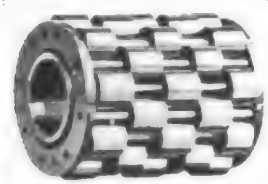
Boring, Slotting and Milling Machine.—A recent machine tool which is capable of performing a variety of operations is shown in the accompanying illustration. The machine is designed for boring, slotting and milling, and is provided with a table which has a universal movement. The table is mounted on a saddle which has a transverse movement on the bed, and the table has a movement at right angles to the saddle movement. The table is provided with a rotary movement, and is also provided with a vertical movement. The machine is provided with a boring bar which is mounted in a head which has a vertical movement on the column. The boring bar is provided with a feed movement, and is also provided with a rotary movement. The machine is provided with a slotting attachment which is mounted on the boring bar head. The slotting attachment is provided with a reciprocating movement, and is also provided with a feed movement. The machine is provided with a milling attachment which is mounted on the boring bar head. The milling attachment is provided with a rotary movement, and is also provided with a feed movement. The machine is provided with a power feed for the table, saddle and boring bar head. The machine is provided with a power feed for the slotting attachment and milling attachment. The machine is provided with a power feed for the rotary movement of the table. The machine is provided with a power feed for the vertical movement of the table. The machine is provided with a power feed for the transverse movement of the saddle. The machine is provided with a power feed for the vertical movement of the boring bar head. The machine is provided with a power feed for the rotary movement of the boring bar. The machine is provided with a power feed for the feed movement of the boring bar. The machine is provided with a power feed for the feed movement of the slotting attachment. The machine is provided with a power feed for the feed movement of the milling attachment. The machine is provided with a power feed for the rotary movement of the milling attachment. The machine is provided with a power feed for the reciprocating movement of the slotting attachment. The machine is provided with a power feed for the rotary movement of the slotting attachment. The machine is provided with a power feed for the feed movement of the slotting attachment. The machine is provided with a power feed for the rotary movement of the milling attachment. The machine is provided with a power feed for the feed movement of the milling attachment. The machine is provided with a power feed for the rotary movement of the boring bar. The machine is provided with a power feed for the feed movement of the boring bar. The machine is provided with a power feed for the vertical movement of the boring bar head. The machine is provided with a power feed for the transverse movement of the saddle. The machine is provided with a power feed for the rotary movement of the table. The machine is provided with a power feed for the vertical movement of the table. The machine is provided with a power feed for the feed movement of the table. The machine is provided with a power feed for the rotary

## ARTIFICIAL LAKE PROPOSED FOR AFRICAN DESERT

Climatic conditions in South Africa would be improved by the creation of an artificial lake in Kalahari Desert, according to a scientist who has made a study of that section of the continent. His plan for placing water in the arid region is not a new one, however, as it originated with David Livingstone, the famous explorer, who saw the possibilities of such a scheme many years ago. To form the desert lake the scientist would construct a dam near the mouth of the Shobe River, which flows into the Zambezi River near Victoria Falls, and another in the Kamene River, near the border of Angola. Low dams would hold back the waters of these streams and cause them to flow into the desert basin. If it became desirable to increase the size of the lake, this could be accomplished by building a dam across the Zambezi River.

## ROLLER ARRANGEMENT GIVES STRENGTH TO ODD BEARING

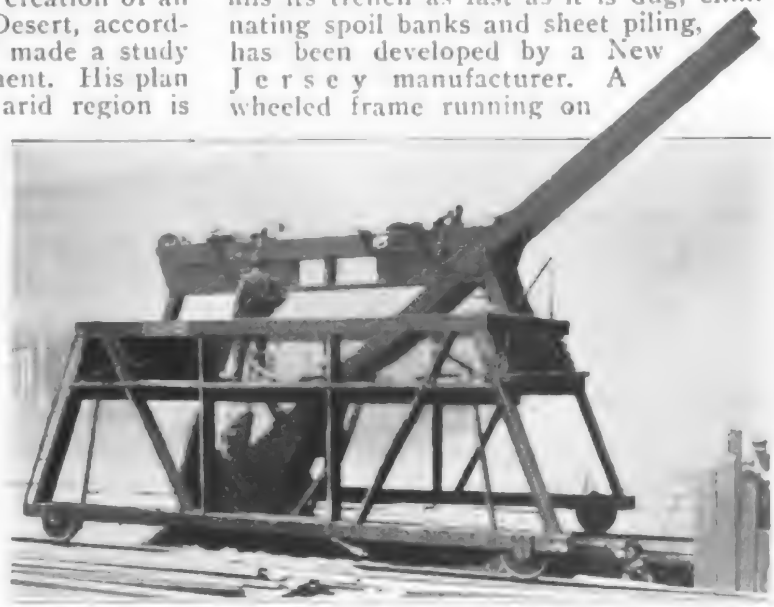
Manufacturers of roller bearings will watch with interest the commercial success or failure of an odd bearing made by an eastern plant. In place of the conventional rollers, this bearing employs a greater number of discontinuous rollers which are staggered to mesh with each other. Each set is so mounted on an alinement shaft that the roller at one end rotates independently of the other. The novel arrangement is said to insure smoother flow of lubricant than with the old type, in addition to an ability to bear a greater load.



¶ The rate of pay established during the war for the enlisted men of the U. S. Navy is now permanent, so that the lowest is about $32.60 a month.

## MODERN TRENCHING MACHINE BACK-FILLS AS IT DIGS

A trench-digging machine that backfills its trench as fast as it is dug, eliminating spoil banks and sheet piling, has been developed by a New Jersey manufacturer. A wheeled frame running on street rails carries a dipper bucket, whose beam is operated by an engine on a car stationed ahead of the trench. The operating cables, temporarily anchored at the opposite end, serve also to move the machine along, the excavated material being at once carried back and dumped. With two operators, on a winter job, the machine dug 100 ft. a day in clay, 80 ft. in gravel and sand, and 30 to 40 ft. in hardpan, the trench being 4 ft. wide and 11 ft. deep.



Trenching Machine That Carries the Excavated Material Back and Refills Its Own Trench, the Cables That Operate the Dipper Bucket Also Moving the Machine along the Track

## DANISH PROCESS MAKES WOOD HARDER AND MORE DURABLE

A patented process for artificial ageing and hardening of wood forms the basis of a new industry in Denmark, whose product, whatever the raw material, is designated by the general term "teakin wood." Ash so treated is declared to take the place of genuine teak. Fir takes on a solid color and character that renders it desirable for furniture, office fittings, and veneers. Birch becomes mahoganylike, and even elm loses its unsatisfactory peculiarities. The normal ageing effects of years are said to be accomplished in 24 hours, and subsequent evaporation of retained moisture leaves the wood remarkably hard and durable.

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## SANDWICH COUNTER ON CAR SELLS TO PEDESTRIANS

Commercial enterprises of all sizes have found the motor vehicle valuable.

Hungry Pedestrians in an Eastern City can Buy Sandwiches, Doughnuts, and Cakes from the Young Woman Owner of This Shelf-Equipped Automobile

One of the smaller businesses to benefit by using the automobile is that of a young woman who sells sandwiches, doughnuts, and cakes in a large eastern city. The wares are displayed on an awning-sheltered shelf on the side of a common type of light touring car, which is driven wherever the chances for trade are best. When the machine is drawn up at the curb, the food on the shelf attracts the patronage of many pedestrians.

## COLUMBIA UNIVERSITY OFFERS HOME-STUDY COURSES

Realizing that many individuals are compelled by financial and other reasons to drop reluctantly their ambitions for higher academic training, Columbia University of New York City announces the establishment of home-study courses. This extension work will be rewarded by no university credits or degrees, but is intended simply as a means of providing a liberal education for all who desire it. Applicants who convince the university authorities of their earnestness and general fitness may thus enroll at any time for certain of the courses given to resident students. Upon completion of his work, the student will receive a certificate stating that definite work has been completed. All instructors are members of the university staff.

¶ The airplane mail service is now on the same basis as the railroad train service, first-class matter being carried at the regular rate of two cents an ounce.

## WALL AROUND CANTON RAZED BY MODERN CHINESE

Built centuries ago to protect the city from organized armies and marauding bands, the wall around Canton, one of the large cities of China, is being razed to make room for modern utilities. On its site will be laid tracks for electric cars, while parallel with the tracks will be built an improved road for motor vehicles. The value of the highway lies in the future, for at the present time there is but one automobile in Canton, according to recent visitors in the oriental metropolis. Moreover, unless that portion of the city which is inclosed by the wall is rebuilt on a different plan, motor cars will be restricted to the outskirts of Canton, as the streets of the inner city are too narrow to permit the passage of such vehicles.

## MUSHROOMS SUPPLANT BEER IN EASTERN BREWERY

Mushrooms have supplanted beer in a large brewery located in an eastern city since the advent of prohibition, and their sale is proving almost as profitable as was that of the now forbidden beverage. The delicacies are grown in the extensive underground rooms of the plant, where conditions are exactly suitable to their cultivation. A force of men is kept busy harvesting the crop and packing it for market.

Harvesting Mushrooms Grown in the Cellar of an Eastern Brewery: This Crop Returns a Large Profit on a Small Investment

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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The Graceful Limousine at the Left Is Really an Ambulance, as Seen at the Right. The Tire Rack Swings Down to Become a Broad Step; the Entire Rear End Opens to Disclose a Roomy Interior, Luxuriously Upholstered, and Provided with Folding Chairs and a Comfortable Stretcher-Cot. The Similarity to a Conventional Police-Patrol Wagon has been Studiously Avoided

## CONVERTIBLE LIMOUSINE BECOMES AMBULANCE

By means of a few clever departures from conventional design, a body-building concern has produced an automobile ambulance that differs little in appearance from the ordinary limousine. The customary similarity to a police-patrol wagon has been carefully avoided. To receive the patient, the whole rear end of the body swings open, revealing a roomy, upholstered interior. Meanwhile, the rear tire rack has been swung down to become a broad step.

## SKELETON OF GIANT WHALE MOUNTED ON TRUCK

Assembled on a truck, the bones of the large whale which was washed ashore at Pablo Beach, Fla., as described in the August issue of Popular Mechanics, will be taken through the country and exhibited at different points. While preparing the skeleton for the tour, workmen found that two sections of the bony structure were tubercular. It is believed that the disease disabled the giant mammal, causing it to drift into southern waters. Six weeks were required to mount the skeleton.

## CEMENT WATER-PIPE UNIONS TRIED IN WESTERN CITY

Cement as a substitute for lead in connecting the joints of cast-iron water pipes is employed in Portland, Ore., and is declared to have given satisfactory results, besides being cheaper than the metal. An extremely dry mixture is used, this being forced in at the unions over a small quantity of yarn or oakum, which is driven in before the cement is applied. It is necessary to keep the joints wet for 36 to 48 hours after the work is done. Nine miles of mains have been laid in this manner during the last two years, requiring 19,256 lb. of cement. The same installation would have required 68,390 lb. of lead, costing 16 times as much.

## STEAMING COFFEE-CUP SIGN ADVERTISES RESTAURANT

Patrons are attracted to a lunch room in a western city by a novel advertising device invented by the manager of the eating place. Fastened to the upper edge of the electric sign, which extends over the sidewalk in front of the restaurant, are a huge cup and saucer, fashioned of metal to resemble chinaware. From the cup steam rises continually, giving the impression that the vessel is filled with hot coffee. The designer of the contrivance has obtained a patent on the system for supplying steam to the cup. In operation it is connected with the heating plant of a building.

A Steaming Cup on an Electric Sign in Front of a Lunch Room Suggests Coffee, and Attracts Patrons to the Eating Place

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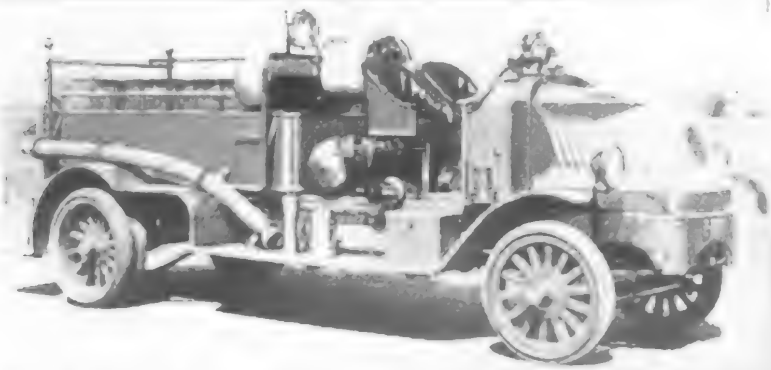
## HOOD PROTECTS MINERS FROM FALLING ORE

Protection from falling rock, or ore, spilled down the shaft from the skip when it is being dumped at the top of the headgear, is given men working in a northern Minnesota iron mine by a hood of sheet steel. This hood is placed at the mouth of the shaft and deflects anything falling from above away from the shaft. Miners using the ladder way are thus made safe from bombardment. Drawbars, which are opened only when the skip is at rest, guard the shaft mouth, while conspicuous warning signs are posted on the headgear. The shaft of this mine is lined with reinforced concrete as a fire-prevention measure.

Climbing the Ladder Way of This Minnesota Iron Mine is Not Attended with the Danger of being Struck from Above by Falling Rock and Ore, Thanks to the Hood at the Mouth of the Shaft

## NEW MOTOR FIRE ENGINE HAS ROTARY PUMP

The familiar reciprocating-pump fire engine has remained standard, in spite of improvements in other pump forms, because of water-hammer and vibration difficulties when rotary pumps were used. A new type of motor-driven fire engine, however, has demonstrated the advantages of a properly designed rotary pump. Gear teeth that take in and discharge the water at the sides, as well as the ends, overcome squeezing effect, and consequent pulsation of the fluid. The bronze pump gears, instead of grinding each other, are driven by interlocked steel gears running in oil. Any water escaping from



Motor Fire Engine, with a Specially Designed Rotary Pump Instead of the Usual Reciprocating Variety

The Rotary Pump in Action, Demonstrating That Pulsation and Water Hammer have been Overcome and a Highly Efficient Fire-Fighting Unit Produced

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the outlet side to the shaft is returned, by an ingenious groove system, to the suction chamber, which permits the use of low-pressure packing in the stuffing boxes, requiring less driving power. An efficiency of 83 per cent is claimed for the new pump, making a fire-fighting unit of unusual power and capacity, which should be practically trouble-proof.

## GOVERNMENT REGISTERS WORD UNDER OWN TRADE-MARK LAWS

For the first time in its history the government of the United States has registered a trade-mark under its own patent-office laws. The word so distinguished is the familiar "Liberty" applied to airplane engines and parts. In connection with this unusual action it will be recalled that the engine was known as the "United States Standard Aircraft Engine" back in the experimental days of 1917. Workers in the Bureau of Aircraft Production, then the Equipment Division of the Signal Corps, were human, however, and so cast about for a nickname. "Liberty" was happily the word suggested, and adopted by general consent. But the name was later applied to a dozen different articles, including soft drinks and hamburger steaks, as well as commercial airplane commodities, with the result that the government has been forced to take this action to prevent confusion.

## GOVERNMENT EXPERTS INSTALL SECRET CHEMICAL PROCESSES

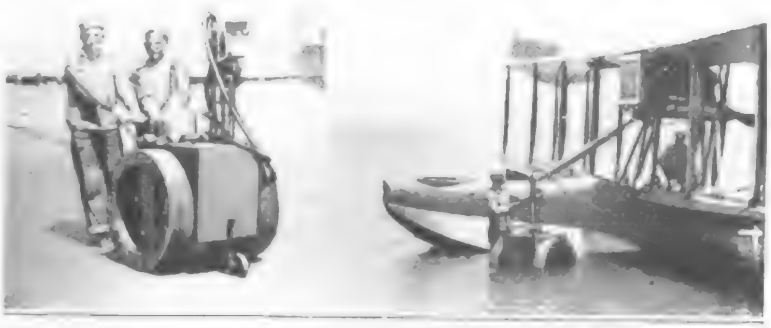
An attractive scheme for close-knit cooperation between the government and the chemical industries of this country has lately been announced by the Department of Agriculture. To plants desiring them will be assigned government laboratory experts familiar with certain newly discovered, cheaper processes for the manufacture of dyestuffs and medicinal preparations. These men will supervise the installation of the new systems, provided the manufacturer agrees to keep the processes a secret. The department will retain the patent rights for government and public use.

## STEAM COOKERS MADE SAFE BY COPPER DIAPHRAGMS

Steam cookers used in the kitchens of a submarine base on the Pacific coast are prevented from exploding by a device of the utmost simplicity. When the cookers were made by sailors stationed at the base, it was found inexpedient to equip them with safety valves of the type used on steam-engine boilers, as is sometimes done, and another means of safeguarding the navy cooks was used. A hole was bored in the side of each cooker, and over these were soldered thin disks of copper. The soft metal diaphragms burst when the pressure becomes too high for safety.

## SEAGOING FUEL CARTS USED AT SEAPLANE STATION

A wide-wheeled gasoline wagon for use on sandy beaches and shallow water has been developed at a naval seaplane station. The conventional type cannot be used when the seaplane is more than a few feet from the shore, because of the narrowness of the wheels. The new "wagon" with its wider wheels moves easily over the sand, however, and may be pushed through shallow water to the side of the plane. The reservoir is made waterproof by extending the air vent upward with a bit of copper tube.



By Extending the Air Vent Upward with a Length of Copper Tubing, and Attaching Wide Wheels, the Land Crew at a Naval Air Station has Developed a Fuel Wagon Which may be Pushed across the Sandy Beach and through Shallow Water to the Seaplane

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## OPERATING TABLE FOR HOGS INVENTED BY KANSAN

The chief difficulty encountered in administering anticholera serum to hogs—that of holding the animal while the fluid

Operating Table for Hogs: The Animal is Held in Proper Position for Inoculation by This Device, and Weighed at the Same Time

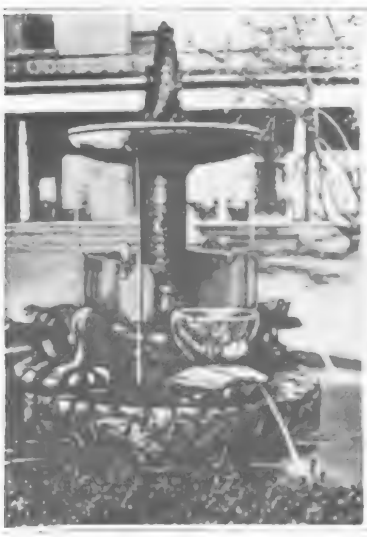
is injected—has been overcome, it is asserted, by an operating table recently invented by a Kansas veterinary surgeon. Besides holding a porker in the proper position for inoculation, the contrivance weighs the hog. It consists of a V-shaped trough, held in an inclined position by a collapsible steel frame; weighs 40 lb., and can be folded and carried on the running board of an automobile.

## ABSORBENT MAKES ARMY MASKS PROOF AGAINST DEADLY GAS

On advice from the Bureau of Mines the government has repeatedly warned the public against the indiscriminate use of the army gas mask. It is peculiarly ineffective against the insidious carbon monoxide. But the bureau has now published the story of its widespread activities during the war; and therein describes the development of an absorbent for carbon monoxide which may be placed in the army canister. Twenty grams (a little over five drams) afford protection for one hour against an atmosphere containing one per cent of carbon monoxide. The problem previously baffled scientists for years.

## RUSTIC CONCRETE PERGOLA ADORNS HOTEL GROUNDS

Many of the creations of the modern concrete molder are such excellent imitations of natural things that only a trained eye can detect the difference. On the grounds of a hotel in a Utah city there stands a rustic arbor that looks as if it had been made of the bark-covered branches of trees. As a matter of fact, the material is concrete, reinforced with metal. The upright posts were formed by imbedding iron pipes, wrapped with wire fencing, in mortar, while the crosspieces and longitudinal bars were molded around iron pipes. Finishing touches were put on by hand. Another feature of the hotel's grounds is a concrete fountain, on the base of which suitcases, frogs, fish, turtles, and other objects, are modeled.



Only a Close Inspection of the Rustic Arbor Which Adorns the Grounds of a Hotel in a Utah City will Reveal That It is Made of Concrete. Iron Pipe and Wire Fencing were Used to Reinforce the Mortar. At the Same Establishment can be Seen the Appropriate Concrete Fountain Shown at the Left

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Where the Dreaded European Corn Borer has been at Work, the Piles of Cornfield Rubbish, and Even the Ground, are Sprayed with Burning Oil, Drawn from a Machine Designed for This Particular Work

## BLIND ROPE WORKERS PROVE SKILLFUL IN NEW FIELD

Blindness is not a handicap in work requiring skill in knotting and splicing ropes, it has been learned through an experiment conducted by a Pacific coast tent manufacturer. Because of the labor shortage during the war, this employer appealed to an institution for the blind for assistance, and was allowed to select a class for training. Only a few days were required to teach the students one of the most complicated knots, and within a week the blind employes were able to produce results equal to those of their teachers. Large ropes were used for instruction, the sensitive hands of the apprentices being passed over these in the several stages of the various knots until their fashioning became familiar to the beginners. As there is an increased demand by shipyards and airplane factories for labor skilled in this work, it is expected these fields will employ many blind persons.

The Stalks Infested by the Corn-Borer Pest are So Weakened That They Break Down of Their Own Weight

## USE LIQUID FIRE AND STEAM TO KILL CORN-BORER PEST

Spreading rapidly, over Massachusetts and other New England states into New York State, and threatening the whole country, is an invading army of European corn borers—a grublike pest of appalling destructiveness. The commonwealth first named spent $50,000 in fighting the menace, and then called for Federal aid, and a government expert has devised a successful method of combat. All the infected ground, the stalks, and cornfield rubbish are sprayed with burning crude oil. A machine has been designed that covers a surface six feet wide with flame, though an ordinary power sprayer with a special nozzle, burning over about three feet, has been used with success. The liquid fire, reaching all the hidden interstices of the stalks, effectually destroys the borer. Another method, used with excellent results, is to pile the old stalks under a cover, and introduce live steam from a portable boiler.

Another Successful Method of Killing Borers in the Stalks is to Rake the Rubbish into Piles, Cover a Pile with a Canvas or Tarpaulin, and Then Admit Live Steam under the Cover from a Portable Boiler

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is thicker than that ordinarily used for such purpose, and each piece is beveled at the edges. Shades inside the dome regulate the amount of sunlight admitted to the conservatory.

## TURN FAMOUS OLD WARSHIPS INTO TARGETS AND JUNK

In the navy the course to obsolescence is not long, and 15 years brings many changes. That long ago, the might of the American Navy was represented by a fleet of twelve splendid ships which are going today to the targets and the junk yards. Four of them, the "Oregon," the "Iowa," the "Indiana," and the "Massachusetts," helped win the Spanish war. The others—the "Kearsarge," "Kentucky," "Alabama," "Illinois," "Wisconsin," "Ohio," "Missouri," and "Maine"—were launched a few years later, and all joined in the world cruise of 1907. In the great war the old ships performed their last service, in training and coast-defense work. Now the "Oregon" has been offered to its name state for a museum or training ship, the "Iowa," "Massachusetts," and "Indiana" will be wrecked for their parts, and the rest will become either junk or targets for trying the guns of younger ships.

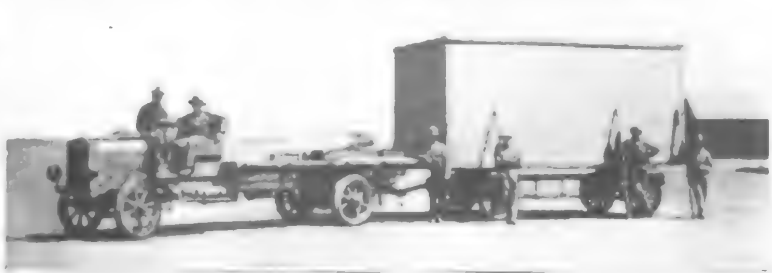
## SAFETY EXITS FROM ARSENAL LEAD DOWN SMOOTH CHUTES

Alongside the open stairways leading to the second floors of various buildings at an eastern arsenal, are what appear to be duplicate flights wholly incased in metal runways. The covered structures, however, are not stairs, but chutes, with floors of highly polished hard wood. The apartments from which they open are the measuring rooms of the arsenal's gas-filling plant. A quick exit from these quarters might, under certain circumstances, be quite desirable, and the chutes afford the means for an almost instantaneous, but easy, descent.

The Structures That Angle up the Sides of the Buildings Look Like Covered Stairs, but They Are Not. They Are Metal Chutes, with Hardwood Floors, for Quick Escape, if Necessary, from the Gas Rooms of the Arsenal

## OLD AIRPLANE BOX MAKES EMERGENCY DARK ROOM

Just two hours after the overtaxed photographic department at a large aviation field called for additional dark-room space, an old airplane crate was ready for business in that capacity. Soldier-mechanics lined it with black paper to make it light-proof, provided for ventilation with an electric fan and a hole in the ceiling, roofed it with tar paper, swung a door in one side, built benches along the walls, and finally fitted it with two old sinks, and provided facilities for running water.



This Old Airplane Crate was Transformed within Two Hours into a Complete Photographic Dark Room, Light-Proof, Water-Tight, Automatically Ventilated, and Equipped with Benches and Running Water

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# CIVIC FEATURES THAT PROMOTE THE COMFORT

A Scene in Kenilworth, One of Chicago's Delightful Suburbs: The Town Lies North of the City, on a Bluff Overlooking Lake Michigan. Depicted Here Is a Street of Concrete, and a Bridge of Rough Stone, Built to Harmonize with Its Natural Surroundings. On the Pillars Are Artistic Lamps

Introducing "Buster," the Canine Mascot of the Chamber of Commerce, Sacramento, California, Campaigning for Votes for a Bond Issue to Build a Municipal Filtration Plant

In the Center of Anaheim, California, Is a Lofty Steel Flagstaff, Which Serves Not Only to Display the Stars and Stripes, but to Regulate Traffic

Built and Furnished with Funds Raised by Women, This Attractive Bungalow, near Phoenix, Arizona, Is the Scene of Rural Social Functions, Arranged by Farmers' Wives and Daughters



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# AND ENJOYMENT OF VISITORS AND RESIDENTS

Community Canning is Approved in a Practical Manner by the Women of Asheville, North Carolina, Who Gather in This Well-Lighted, Completely Equipped Kitchen, Built over a Public Fountain, to Can Fruits and Vegetables. Water for Washing the Products is Supplied by a Pipe from the Fountain

Each One of the Wreath-Adorned Markers around a Monument to the Heroes of 1861-65 in Elkhart, Indiana, Represents a Citizen Who Died in the World War

As Permanent as the Milestones of Another Age, These Inexpensive Concrete Road Markers, with Indented Lettering, are Becoming Plentiful in Some of the Southern States

Though Horses are Fast Disappearing from the Streets, Residents of Pasadena, California, are Not Neglecting the Few Faithful Beasts Still Competing with the Automobile, as is Shown by This Beautiful Drinking Fountain

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## FILLING-STATION FOUNTAIN SERVES COOL DRINKS

Not only can motorists replenish their supplies of fuel and lubricants when they stop at an attractive filling station in a California town, but they can refresh themselves with cooling drinks or ice cream, served by the same young woman who attends to the gasoline and oil pumps. A soda fountain was installed in the station by this young woman, the owner, who rightly judged that soft drinks should be as much desired by hot and dusty tourists as provisions for their cars.

Gasoline, Oil, and—Soft Drinks are Sold at This California Filling Station, Which is Owned by a Young Woman

## MEMORIALS TO JAMES WATT PLANNED BY SCIENTISTS

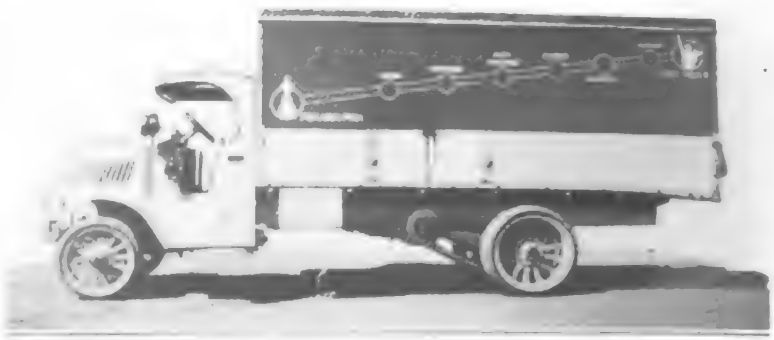
Plans for establishing lasting and practical memorials to James Watt were considered by a number of British scientific and engineering organizations at a representative meeting held some time ago in Birmingham, to devise ways to celebrate the centenary, August 19, of the Scottish inventor's death. One phase of the tentative arrangements provides for the erection of a building to be used as a museum for examples of the work of Watt and his contemporaries. It also was proposed to publish a memorial volume and to endow a professorship of engineering at the University of Birmingham in his honor.

## STRIKING FOG-HIDDEN POLE, PLANE TUMBLES TO BEACH

Two army airmen recently escaped serious injury by a miracle while making the last leg of a recruiting flight from Texas to Minnesota, Illinois, and the eastern states. Running into a thick evening fog while flying above Rockaway Beach, L. I., they circled down to get their bearings. As they swooped over the beach, a wing of their airplane collided with a 100-ft. flagpole, twisting the machine into a nose dive. Airplane and airmen crashed together upon a mud flat left bare by the receding tide. The pilot crawled from beneath the wreckage; his passenger was pinned to the ground and had to await the arrival of a rescue party from a nearby hotel. The machine was covered and probably ruined by the rising tide.

## DIAGRAMS ADVERTISE ROUTE OF EXPRESS TRUCKS

Diagrams painted on the sides of trucks, operated by a motor-express company between two large eastern cities, give full information of the route followed and the stops made on the run. Large circles at either end of a double line running diagonally across the side of each truck represent the terminal cities, while smaller circles, at intervals between, indicate intermediate stops.



A Glance at This Truck, Which Is One of a Fleet Operated by a Motor-Express Company in the East, Tells Where It is Going and Where It will Stop. The Diagram and Its Details can be Seen at Considerable Distance

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## CITY ERECTS MEMORIAL LAMPS TO SONS WHO WENT TO WAR

At the intersection of two busy streets one municipality has voted to erect by public subscription four useful monuments to its boys who went to war. On each corner will be placed a bronze column, bearing a lamp, and supported by a heavy granite base. On four bronze tablets, which will sheath the upper part of the base, will be engraved the name of every soldier and sailor. The memorial lamps were designed by a local artist and will cost $2,000 each.

**On the Corners of a Busy Street Intersection will Stand Four of These Bronze Columns, Memorials to the Local Men Who Went to War**

## RANCHMEN HUNT RATTLERS WITH CAVALRY SABERS

Killing rattlesnakes with cavalry sabers may not appeal to some as a gentle sport, though undeniably thrilling; yet ranchmen of Owens Valley, in eastern California, spend much of their spare time in its pursuit. The paramount object, naturally, is to get rid of the rattlers, and the saber has been found an ideal tool for that work. Armored in heavy boots and gloves, the hunter beats the bush until he hears a snake signal, and then proceeds to excite the reptile until it strikes. A stroke of the blade then ends its venomous career in mid-air. Equipped with a job lot of old sabers, 22 men thus slew 72 of the serpents on one trip.

## LANDING ON FIELD TOO SMALL, PLANE CRASHES INTO CROWD

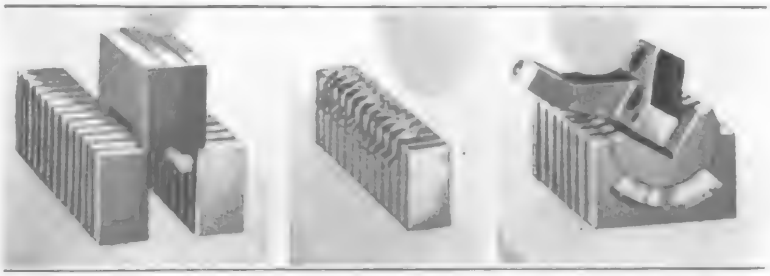
Attempting to make a landing on a field too small for his heavy plane, a Victory-loan flier at Forest Park, St. Louis, smashed through the guard cable about the field, and the machine, nosing over into the crowd, injured three persons seriously, and several others more or less severely. The pilot, who was uninjured, was driving a German Fokker biplane as part of the flying circus touring the country for the last Liberty loan. An experienced airman, he had already made one unsuccessful effort to land in the insufficient space, "zooming" over the heads of the crowd and circling the field again in a stiff and changing wind. For safety to observers as well as fliers, it is obvious that a definite minimum figure for landing-space area must be provided, and such space must be kept clear, for there are no brakes on an airplane.

## SHARK HIDE EMPLOYED TO POLISH DIAMONDS

The hard outer coating of the shark has been found to become so hard after exposure to the air that it will scratch diamonds. So, some of this material is now ground into powder, and used for diamond polishing in place of the diamond dust commonly employed.

## USES OF MAGNETIC CHUCKS INCREASED BY DEVICE

Designed to hold pieces of irregular shape for grinding at unusual angles, an attachment for magnetic chucks has been found to multiply the uses to which that device may be put. In its simplest form the attachment is a block made up of alternate plates of steel and insulating material, so arranged as to correspond with the laminations of the chuck. When in use, the attachment is placed on the chuck and is magnetized by conduction. There are several types of the attachment, including a protractor type, with a flat, plane, and V-block surface bar; a V-block type, and a plane-surface type. Each of the several types is made in a number of different sizes.



**In Principle an Extension of the Magnetic Chuck, the Attachment Shown Here Provides a Variety of Surfaces upon Which Pieces of Irregular Shape may be Placed for Grinding. Several Sizes of the Different Types are Made**

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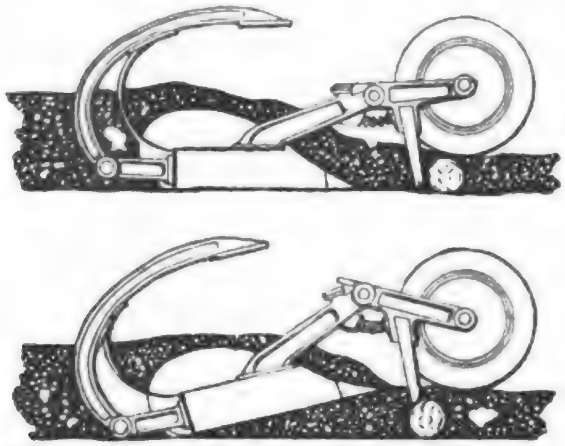
## HINGE IN BEAM ENABLES PLOW TO JUMP OBSTRUCTIONS

The "stump-jumping" plow has appeared to gladden the farmer's heart.

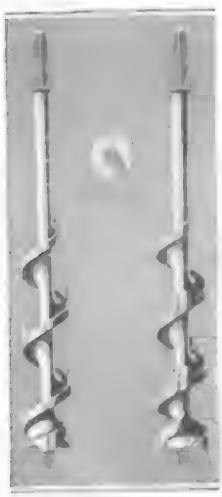


The Two Diagrams Show How the Hinged Plowbeam is Jackknifed by the Coulter, Enabling the Point of the Share to Ride over Obstructions

The beam is hinged between coulter knife and plowshare, with a heavy coil spring placed between the two to keep them alined under normal conditions. But when the coulter knife encounters a stump or heavy root it is forced back, the beam jackknifes, and the plowshare rides over the obstruction.

## NEW AUGER BIT SMOOTHS HOLE WHEN WITHDRAWN

Holes free from splinters are bored by an auger bit that has been patented by a western inventor. At several points on the upper side of the spiral of this bit are sharpened nibs, similar to those at the cutting end of an ordinary tool of this type. These come into action when the bit is withdrawn from a hole, cutting away inequalities and slivers left after the first operation. The bit is recommended for use in wet or green wood.



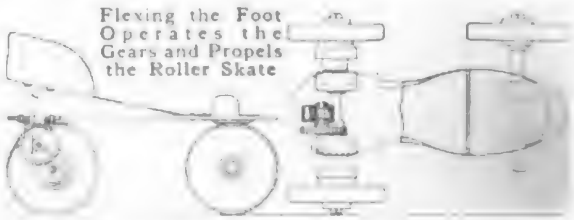
¶To determine the possible value of a meteorological service for cross-country flying, the Army Air Service offers to make a 30-hour forecast for any airman intending a long flight.

## LOCKING SYSTEM FOR DOORS PROTECTS DELIVERIES

Double doors which lock alternately are the invention of an American living in England. The system permits packages to be left at a residence during the absence of the occupants, or without disturbing them if they are present. When the outer door is opened, the inner door, which leads to the rooms of a house or apartment, is locked automatically. Shutting the outer door and turning the knob unfastens the inner door and locks the outer. By opening and shutting the inner door, the outer is unlocked. Pockets for parcels are placed on the inside of the outer door.

## ROLLER SKATES PROPELLED BY RIDER'S WEIGHT

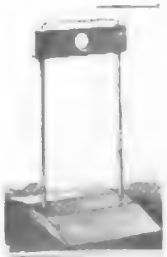
The novice on roller skates is apt to think they run easily enough without mechanical assistance. For the sophisticated, however—which includes most children—two Oregon inventors have provided a new thrill. On each skate they have placed a spring heel plate, which, as it ascends and descends, operates gearing that turns the rear wheels. Mere



Flexing the Foot Operates the Gears and Propels the Roller Skate

flexing of the foot as in walking, therefore, drives the skater forward at considerable speed, the free-running wheels needing only an occasional impulse.

## A CROQUET ARCH VISIBLE IN TWILIGHT



A novel croquet arch that can be easily seen has been invented by an army colonel. Instead of a curved arch there is a block of wood with a large hole in the center toward which the ball is directed. The blocks are usually painted a dark color and the open space makes the arch always visible. The base seen in the illustration serves only as a temporary mounting for demonstration purposes.

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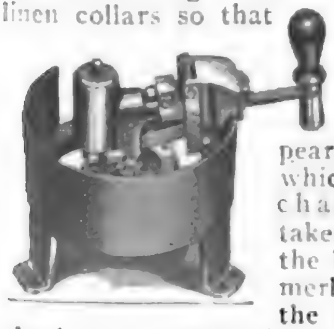
## MILDEW-PROOFING PROCESSES TESTED IN LABORATORIES

Tent canvas, which has been treated by some mildew-proofing process, can be tested in laboratories by a method recently devised by scientists. Disks, about $3\frac{1}{2}$ in. in diameter, are cut from the cloth to be examined and soaked in running water for two or three days. They are then placed in plates containing agar jelly and incubated in a darkened room with a temperature of from 68 to 77° F. for three weeks or a month. Each week the disks are examined and their condition noted. The resistance against fungous growths of materials treated by different processes is thus established, and the value of each process is rated at from 1 to 10, according to its effectiveness. Thus, for instance, canvas treated by a process rated at 6, successfully withstands weather conditions at Washington, D. C., without mildewing.

## COLLARS IRONED WITH HUMAN SKILL BY IMPROVED MACHINE

Laundrymen have long used a curved plate with a self-heating, grooved iron for smoothing the folded edge of linen collars so that they will not irritate the neck. An improved machine has now appeared, however, in which clever mechanical design takes the place of the human skill formerly required. As the operator rotates the iron a ball-bearing roller on a cam-like track carries it gently onto the collar, and, after the edge has been ironed, off the collar and out of the way. A coil spring maintains the proper pressure throughout the single back-and-forth motion necessary for the operation.



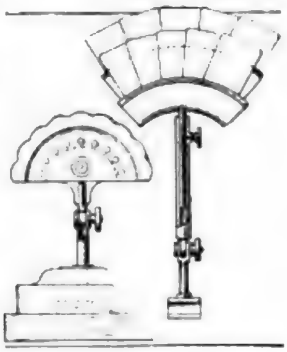
## ADVERTISING ON OCEAN FLOOR SEEN THROUGH GLASS BOTTOMS

The submarine gardens about Santa Catalina Island, Calif., have been made famous by the glass-bottomed excursion boats which travel the waters above them. And there are fish to be seen, thousands of splendid game fish. The tourist is exceptional whose hand fails to itch for a fishing rod as he peers down at them. A local merchant has turned this impulse into cash. He has placed a "signboard" on a sandy stretch under 30 ft. of clear water in the path followed by many of the glass-bottomed craft. Glancing from the fish to the sign, tourists read that "These Fish Bite like Hungry Wolves if You Use Blank's Prepared Bait." The novel practice is restricted to several sandy bottoms and is prohibited in the more beautiful of the submarine gardens.

**As the Tourists Peer through the Glass Bottom at the Famous Submarine Gardens Their Glance Encounters a "Signboard" Placed Flat on the Ocean Floor**

## HOLDER FOR PLAYING CARDS PATENTED IN FRANCE

Even card players have been given attention by the inventor of a labor-saving device. The contrivance intended for their use is a holder for each player's "hand" recently patented in France. It consists of two semicircular plates, between which the cards are held by friction, mounted on a support which can be adjusted as to height or tilted backward or forward. A clamp fastens the holder to a table.



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Musicians Acquire Flexible Hands by Using the Device Shown at the Left. When the Fingers are Placed in the Rests Provided for Them, and the Hand Pushed Forward, the Digits are Extended Fan-Wise

For Packing in a Suitcase or Traveling Bag, This Walking Stick can be Folded to Half Its Length. A Jointed Metal Rod, Which Slides inside the Body of the Cane, Makes This Possible. The Two Sections are Threaded to Screw Together

Shears for Removing Pineapple Eyes: The Blade is Inserted under the Eye, Which is Cut Out by the Sharp-Edged Ring

Useful in the Home for Blacking Stoves, Cleaning Clothes, and Other Purposes, the Fountain Brush Shown Here can be Used Elsewhere for Cleaning Type, Polishing Automobiles, or Stenciling. The Liquid is Contained in the Hollow Handle, and Fed to the Bristles through a Thumb Valve

Shaped to Fit the Edge of a Pot, and to Cover Nearly Half Its Top, a New Strainer of Perforated Sheet Metal Has a One-Piece Wire Frame and Handle, and is Intended for Use on a Cooking Vessel of Any Size

With This Belt around Its Waist and the Side Straps Fastened to the Arms of a High Chair or Perambulator, a Baby is Insured against Falls

Clothesline Holder That Tightens Its Grip in Proportion to the Strain on the Rope: The Contrivance is Made of Cast Iron, Galvanized to Prevent Rusting. A Line can be Removed from the Holder by Pulling Its Free End

Meat or Fish Cooked in the Broiler at the Right does Not Come in Contact with the Gas or Oil Flame Used for Heating. The Grid is Made Up of Hollow Tubes, through Which Pass the Heated Gases Generated in the Combustion Chamber at the Front of the Broiler



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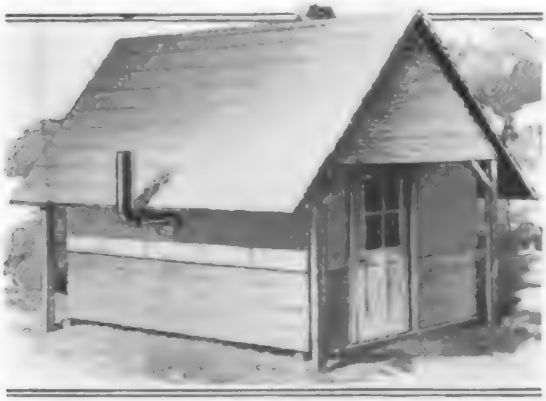
## SHINGLED ROOFS MAKE TENTS COMFORTABLE COTTAGES

Tents are made to serve as comfortable living quarters during the entire year, at



Adding Shingled Roofs, Wooden Walls, and Floors to Tents Makes Them Comfortable in All Kinds of Weather. Doors and Windows Are Other Improvements

a southern California mountain resort, by covering them with shingle roofs and adding wooden walls and floors. Ordinary wall tents, 9 ft. 4 in. by 11 ft. 8 in., with 3-ft. walls, are pitched over frameworks of small timbers so that the canvas walls overlap the wooden walls several inches. Gabled roofs are then built over the tents. These are supported by posts so that there is an air space of 1 ft. between the roofs of the tents and the shingles. Frames at either end of the tents hold doors and windows. In cold weather the tent-houses are heated by stoves.

## DYNAMITE COMPLETES CANAL WHEN DREDGE STOPS

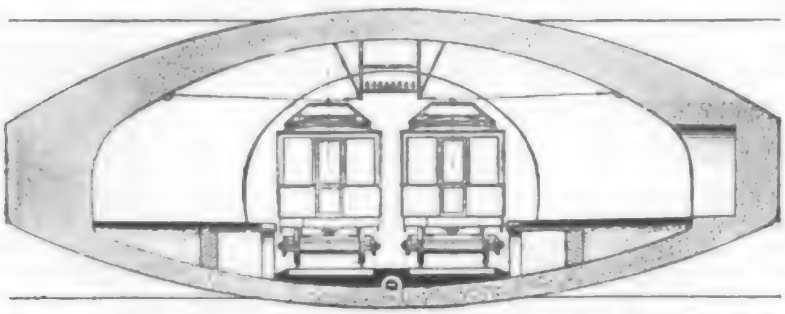
Dynamite rapidly completed a canal that connects the Atchafalaya River with Bayou Teche and the Vermilion River, in Louisiana, when urgent demands for water to save the rice crops along the latter stream made quick action necessary. Dredges were within 500 ft. of the end of the ditch when a shortage of labor halted the work. Holes were made with iron pipes in the soil, along the line on which it was desired to dig, and in these were placed the explosive. After the holes had been filled with earth, which was thoroughly tamped, the charges were exploded. The result was a canal, 12 ft. wide and 4 ft. deep. It would have required several days for a dredge to complete the canal.

## MADRID SUBWAY LINE ABOUT TO BE OPENED

By GEORGE E. PAUL

MADRID is anxiously awaiting the day when the first of the four lines that are to form its modern subway system will be formally opened for public service. For many years there has been a strong and insistent demand for such a system, to help clear the streets of the immense rush-hour throngs. This crowding is at its worst in the great plaza, the Puerta del Sol—the very heart of Madrid. The principal street-car lines of the capital start from this point, and eleven wide thoroughfares discharge their crowds into it. At the evening hours, especially, a jam of people is trying to cross it.

Plans to relieve the congestion, formulated by Spanish engineers and approved by the city council some years ago, called for a system of underground railways, consisting of four lines, of which the first is now nearing completion. This line, in two sections, is about three miles long, and extends from Puerta del Sol, practically north, to Cuatro Caminos, the city limits, where large shops are located. The first section, from Puerta del Sol to Glorieta de Bilbao, a small park about halfway to Cuatro Caminos, runs at a depth of some 60 ft. below street level, in order to avoid the various municipal service pipes, while the second, from the glorieta to Cuatro Caminos, averages only a few feet be-



Cross Section of the New Double-Track Subway being Constructed in Madrid, Spain, Indicating the Arrangement at Stations, Where the Platforms Are 10 to 14 Feet Wide

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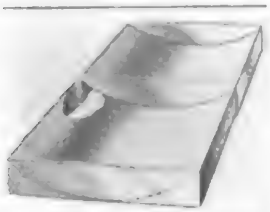
low the ground. The whole line is double-tracked, and the gauge is the same as that of the street railways. The maximum grade is only four per cent, and the sharpest curve has a minimum radius of 300 ft. The stations are of uniform length, about 200 ft., with platforms on either side, from 10 to 14 ft. wide. Five-coach trains, accommodating some 400 passengers, will run on a 2½-minute schedule in both directions, thus affording service to a maximum of 9,600 passengers per hour either way. The stations, walled and arched with white tile and presenting a very attractive appearance, are now finished except for some interior and exterior decorative details, and the tunnel itself is expected to be completed before October this year.

In view of the excellent progress made on this first line, the city council has considered it advisable to continue it southeastward, so that it would extend also from Puerta del Sol to the Glorieta de Atocha, facing the Mediodia (southern) railway station. When completed, this greater line, about four miles in length, would cross the capital from north to south and, by a 15-minute run, connect Cuatro Caminos with the populous southern quarter of Madrid and with the intense traffic of the Mediodia station. It is believed that the completion of the subway system will have a powerful effect in developing the many attractive suburban districts that are spreading out in all directions from the thriving capital.

## METAL DESK TRAY TELESCOPES TO FIT DRAWER OF ANY SIZE

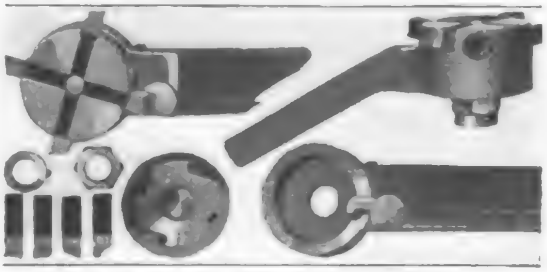
Business folks will value a telescoping metal tray which may be adjusted to fit a drawer of any width. Numerous partitions divide it into sections for clips, stamps, rubber bands, and other necessities. A hole is punched in either end through which a thumb tack may be thrust to hold the tray in position.



¶Several "Yeomanette" posts have already been established as precursors of many women's posts and auxiliaries, soon to be organized and affiliated with the American Legion.

## IMPROVED LATHE-TOOL HOLDER CARRIES FOUR POINTS

When a piece of work in the lathe requires from two to four operations, a new form of tool holder is calculated to save

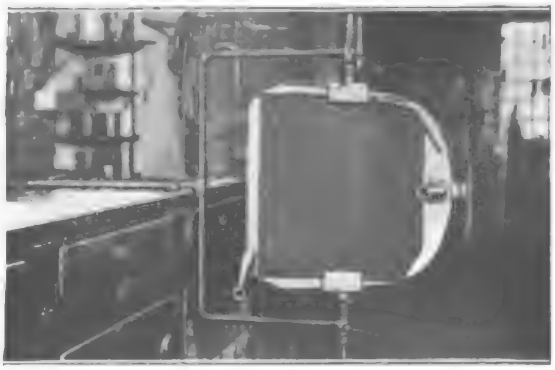


Upper Left, Side View of Turret with Its Four Tool Points; Upper Right, Top View of Holder. Tools, Turret, and Shank are Seen Disassembled Below

considerable time. The head of the holder carries a turret, which is revolved to bring forward any one of four tools which it holds. The sockets of the tools admit bits ⅜ in. square, the shank of the holder itself being 1¼ by ⅝ in. The turret, ground to fit its seat in the shank, is locked, unlocked, and indexed with a wrench which accompanies the holder. Screw adjustment up to ¼ in. takes up the wear of the cutting points.

## CLAMP FOR WORKBENCH HOLDS ANY AUTOMOBILE RADIATOR

The proprietor of an auto-repair shop in Iowa has invented a workbench clamp



Workbench Clamp of Steel Tubing, Adjustable to Hold Firmly an Automobile Radiator of Any Size or Make

that will hold firmly an automobile radiator of any size. A bracket of square Y-shape, made of ¾-in. steel tube, has its stem screw-clamped to the bench. The end of each arm is split, normally held closed by a sleeve, and clasps a transversely sliding corrugated rod, with a clamp for the side of the radiator.

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## PAPER MOTOR-TRUCK TIRES HAVE METAL TREAD

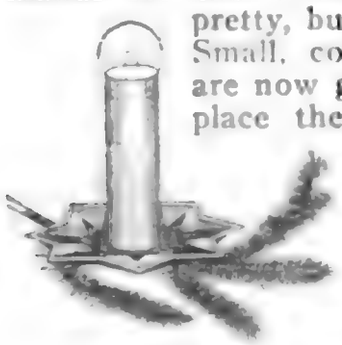
Paper tires for motor trucks are a recent European invention. Shaped somewhat like the regulation solid-rubber tire,

Sectional Views of Metal-Protected Paper Tire: To the Left Is a Longitudinal Section, and to the Right a Cross Section

a mass of paper is firmly attached to the rim of the wheel and covered by numerous stirrups, which form a protective metal tread. The ends of these stirrups fit inside the flanges of the rim and are held there by rivets which pass through large holes in the stirrup ends, as well as through the flanges and paper. This construction permits compression of the paper at the point where the tread is in contact with the road.

## METAL CANDLESTICKS REPLACE TAPERS ON CHRISTMAS TREE

The wax candles which tradition demands for the Christmas tree are very pretty, but equally dangerous. Small, colored electric bulbs are now generally used to replace them, but are seldom satisfactory from an artistic viewpoint. The little holder in the illustration will do much to restore the illusion, however, with a lighted bulb atop its white column. Numbers of them are secured to the boughs of the tree, where they look much like twinkling tapers.

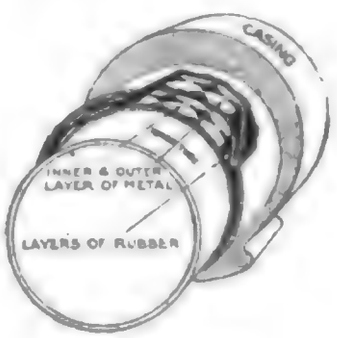


## TEST WATERPROOFED LEATHER BY SCIENTIFIC METHOD

The relative value of various sole-leather waterproofing materials can be accurately determined, it is declared, by a scientific test described at a recent meeting of chemists in Buffalo, N. Y. This test is begun by immersing several pieces of leather of the same tannage and from the same section of the hide, but of varying texture, in different waterproofing liquids, heated to 140° F., and then warming them in an oven of the same temperature. The pieces are then soaked in water for 24 hours, during which time they are bent frequently to encourage absorption. By weighing each piece before and after its treatment with the waterproofing liquid, and immediately after it has been soaked in water, as well as after it has been air-dried, figures are obtained on the amount of waterproofing liquid taken up and the quantity of water absorbed by the treated leather.

## METAL-ARMORED INNER TIRE NEW AUTO ACCESSORY

Another invention for reducing the cost of operating automobiles has been offered to motorists in the form of a metal-armored inner tire. It consists of an outer covering, impregnated with graphite for lubrication, and inclosing three layers of rubber, between which are placed two strips of perforated metal. The tire lining is a fabric treated in the same manner as the covering material. The appliance is intended to shield the inner tube from sharp objects which penetrate the outer tire, and to reinforce the walls and tread of the casing.




## NEWEST WAY TO CLEAN RIFLE: SHOOT BRUSH THROUGH IT

If not the simplest, at least the quickest method of cleaning a rifle is by shooting a brush through it. An English inventor has patented such a brush, made of fine steel wire, designed to fit into a cartridge like a bullet, and about the size of one.

As a measure against the spread of typhus in Poland, the government of the new nation recently issued orders that every man, woman, and child in the country should have the hair shorn from their heads, and that baths be taken by all. There were 100,000 cases of the dreaded disease in Poland when the extraordinary edict was published.

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## FRANCE WOULD AWARD MEDAL TO ALLIED FIGHTING MEN

The French government proposes a step that is perhaps without precedent in the history of nations. To every soldier and sailor of the countries allied against the central powers, and with at least three months' fighting service, she would give a "Victory Medal." The proposed decoration is of bronze, measuring about one inch and a half in diameter. On one side appears a winged figure of Victory with no inscription; on the other is printed the words, "The Great War for Civilization," with the name of the allied nation to which the bearer belongs. The ribbon displays a double rainbow on a red ground with white edges.

## ELECTRICAL GLASS SPLITTER USES HEATED RIBBON

A simple electrical tool for splitting glass cylinders or cutting sheets of the same material has been patented by an Ohio man. It consists of a narrow rib-

Glass is Split by This Tool through the Application of a Ribbon Heated by Electricity. A Spring Stretches the Ribbon over the Frame of the Device

bon of high electric resistance, which becomes intensely hot when used as a conductor. Applied to the surface of glass when heated, the ribbon splits the brittle substance. The ribbon is stretched over asbestos placed in a channel in the iron frame of the tool, and is held taut by a spring at one end. Current flows into the ribbon at the handle end of the frame through an insulated terminal block, and returns to the other terminal, which is grounded.

## SIMPLE SIGNALING DEVICE PLACED ON TRUCKS

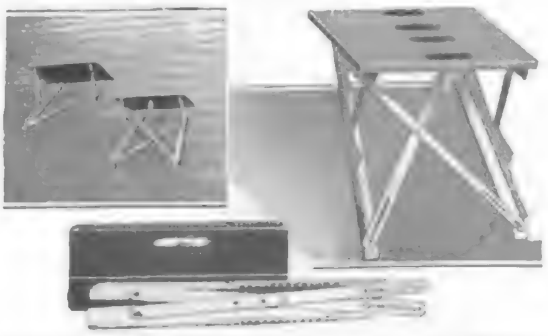
Of the numerous traffic-signaling devices for motor vehicles, probably none is as simple as the one that is being placed on the trucks of an eastern contracting concern. Three differently colored slabs of wood, on which are painted the words "left," "right," and "stop," in large letters, are hinged underneath the truck body at the rear. Attached to the free ends of these slabs are cords which terminate in leather straps near the driver's seat. When the course of the machine lies straight ahead, the signal boards are drawn up out of sight. If a turn or a

Traffic-Signal Boards Hinged underneath a Truck Body at the Rear are Operated by Cords Leading to the Driver's Seat

stop becomes necessary, the proper board is swung down by releasing one of the straps.

## ADJUSTABLE ROOF BRACKET FOLDS FOR SHIPMENT

For use by carpenters, painters, and brickmasons on sloping roofs, a folding bracket seat, invented by a western man, has been patented and is making its appearance on the market. Not only is the device capable of being collapsed for carrying or shipping, but it can be adjusted to provide a level seat regardless of the pitch of the roof on which it is used. Two of the brackets can be used for supporting a scaffold between them if placed at



Adjustable to Provide a Level Seat on Any Sloping Roof. This Bracket Seat can be Folded and Locked for Shipment

the same level on the roof, or several brackets, placed one above the other, form steps on the roof. When the appliance is folded the wooden seat becomes a case for the metal supporting frame, and can be locked for shipping.

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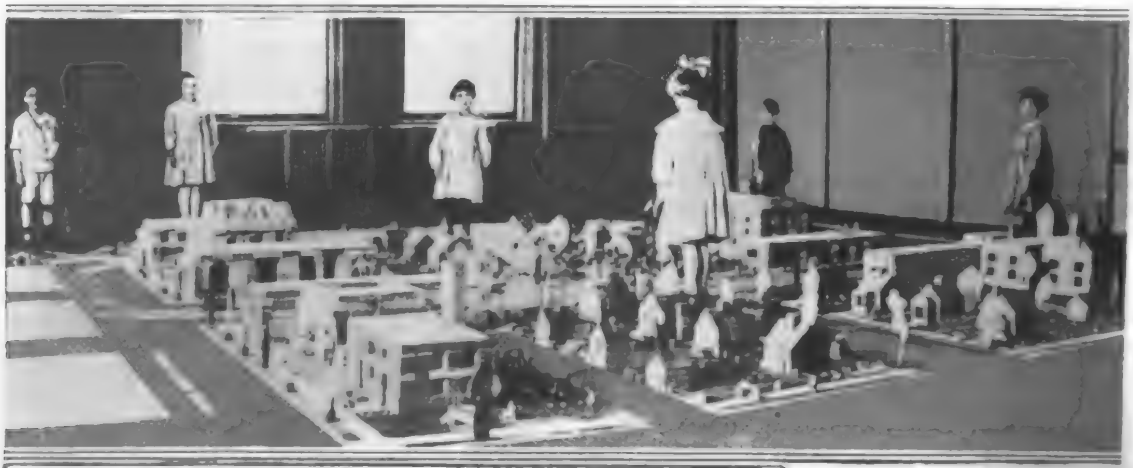
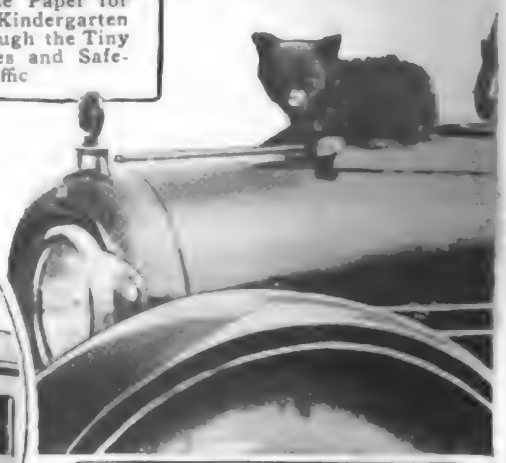
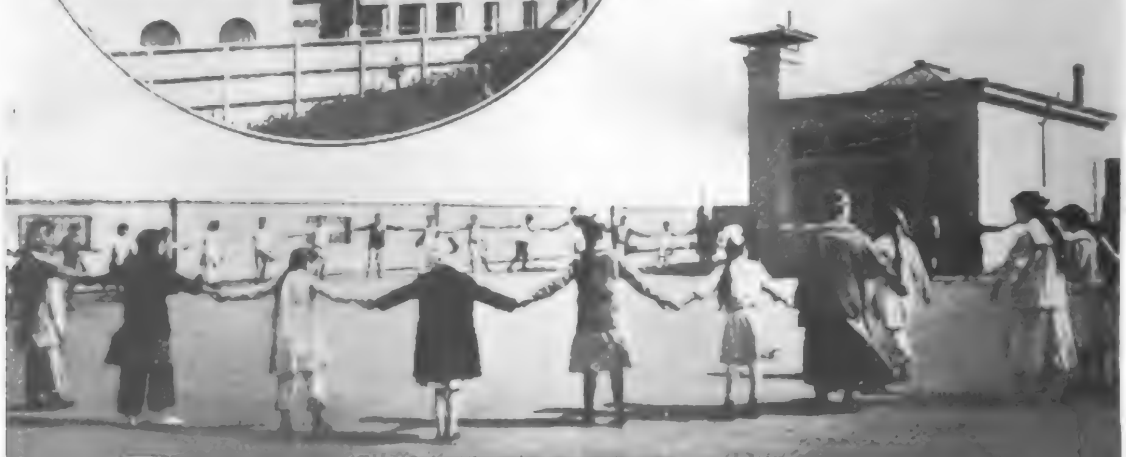


Using "Blocks" for the Erection of the Buildings, Tissue Paper for Lawns and Trees, and Chalk Lines for Railroad Tracks, Kindergarten Pupils Built This Model City. As They Walk Slowly through the Tiny Streets Their Teacher Instructs Them in the Simple Rules and Safeguards That Govern Pedestrian and Vehicle Traffic



This Bear Cub Considers Himself a Better Mascot Than the Kewpie Doll or Ornamented Radiator Cap. He Prefers to Ride in the Back Seat, but the Hood Is Acceptable



The Roof of This Public School in San Francisco's China Town has been Walled In to Form a Playground. Here the Oriental Boys and Girls Assemble to Learn the Health-Giving American Games. Led by White Teachers, They Soon Outgrow Their Shyness, but Never Their Quaint Courtesy. No Matter How Excited, the Chinese Boy Lifts His Hat before Addressing a Teacher. As Seen in the Upper Photo, the Playground Is High Enough above the Street to Escape Its Dust and Grime



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Mitzi May Kuntz, Eight-Months-Old Resident of York, Pennsylvania, Started to Fly a Little Early in Life; but She Wanted to Break the World's Record for Youthful Airplaning, and So Flew 40 Miles with a New York Aerial Policeman

COPYRIGHT, KEYSTONE VIEW CO.

England, Birthplace of the Boy Scout Movement, Now has Started the Sea Scouts, an Organization That Did Useful Work during the War. The Scout on the Left, One of the Oldest in the Service, Saw Three Years of War and was Torpedoed; the Other Boy has Been a Scout for One and One-Half Years

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A Biplane Driven by Velocipede Power Only Needs a Normal Amount of Imagination to Make It Soar Away into the Clouds, and with Its Appropriate Air Gun the Young Pilot can Clean Up All the Germans in the Sky

BY COURTESY OF THE SPHERE, LONDON

An Australian Photographer Lay in Ambush for Two Hours to Get This Rare Picture of a Wild Kangaroo, with Its Young One Conventionally Pouched. The Mother Animal, Wholly Unconscious of the Camera, is Observed to be Holding a Bouquet of Flowers She has Just Plucked



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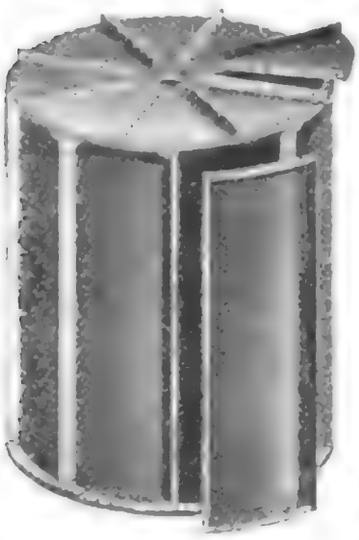
## BIG TANKS MADE IN SECTIONS ON "KNOCKDOWN" PRINCIPLE

Big steel tanks for liquids may now be constructed on the "knockdown" principle by following the design of a Kansas inventor. The cylindrical side walls are built up of a number of curved plates, flanged toward the outside on all four edges, and forming a circle when assembled. An equal number of sectors, flanged at the sides only, form the top of the tank, and a small circular plate is provided for closing the center. The bottom is similar, except that the inner ends of the sectors are flanged, and the opening closed with a flanged disk. All flanges are outside, waterproof gaskets between them, and bolted through steel reinforcing strips.



## GAUZE IMBEDDED IN LEAD AS REINFORCEMENT

Reinforcing lead with iron or steel gauze gives the soft metal rigidity and strength, according to the inventors of a method for accomplishing this result, and overcomes many of the difficulties otherwise encountered when it is used in sheets or pipes. The gauze is prepared by coating it with lead or lead-antimony, and then imbedded in a sheet of lead somewhat thicker than desired. Rolling the sheet while cold reduces it to the proper thickness. A pipe, 8 in. in diameter, made of ¼-in. reinforced lead, withstood a pressure eight times greater than one which burst a pipe of the same diameter, but made of ⅞-in. lead without reinforcement.

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¶ The town of Guthrie Center, Iowa, with a population of less than 2,000, is the first town in Iowa to own an airplane. The town officials have purchased one from the Canadian government, and will use it to advertise the community and in campaigns boosting the town and adjacent territory.

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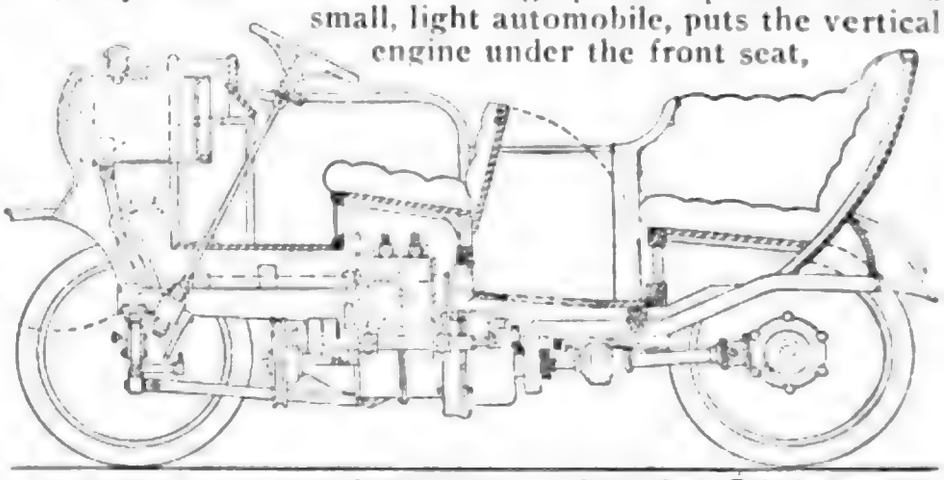
## INDUSTRIAL-FELLOWSHIP IDEA GROWS IN IMPORTANCE

Readers of Popular Mechanics Magazine as far back as April, 1914, may recall the story of the Mellon Institute of Industrial Research of the University of Pittsburgh. At that time laboratory work was being pursued under 21 industrial fellowships, the term signifying endowments made by industrial concerns for the scientific solution of specific problems. Report for the year ended March 1, 1919, indicates a marked increase in this progressive activity, there being now 47 fellowships, with five more awaiting laboratory space, and 77 fellows working. Endowments for the period totaled $238,245. The institute itself, most complete of industrial experiment stations, represents an investment of about $350,000. Five years ago it was housed in a crude frame building.

## AUTO DESIGNED IN JAPAN HAS MOTOR UNDER SEAT

A Japanese inventor, determined to get as much seating space as possible into a small, light automobile, puts the vertical engine under the front seat,



By Placing the Air-Cooled Engine under the Front Seat, This Automobile, of Japanese Design, Secures a Large Seating Space in a Light Car. The Seat is Hinged and Tilts Back for Inspection of the Motor

which tips over backward for inspection. A fan, in a ventilation chamber surrounding the motor, air-cools it. The gasoline tank is in front, in place of the absent radiator. While the architect of this vehicle evidently achieved his object, the result is somewhat reminiscent of our own achievements of 1900, or thereabouts.

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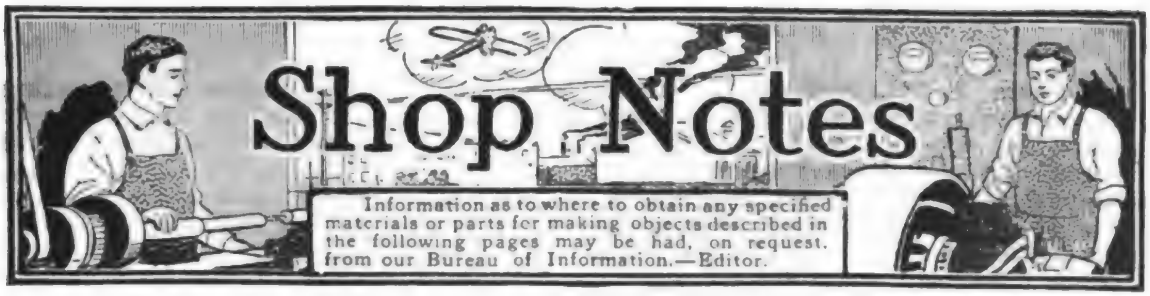


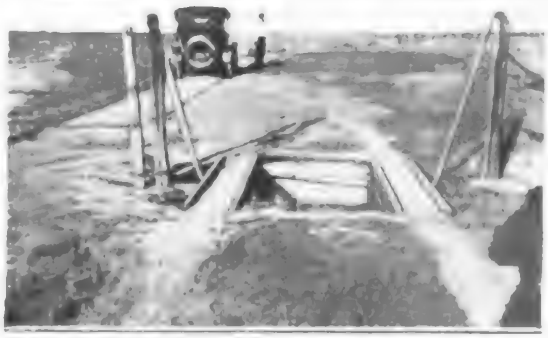

# Animal-Proof Automobile Gates

By THOMAS A. LEADLEY

ON the ranches of western states, where fences are now quite numerous, it becomes very important to have some kind of gate through which an automobile can pass without loss of time, but which will prevent the passage of cattle. The photographs show two types of gate which have made their appearance in response to this demand. The usefulness of such a gate is, of course, not confined to the large ranch. The idea may prove to be a timesaver on many smaller stock and dairy farms.

The gate shown in the first photograph is perhaps the easiest to make, and the least expensive, though not very durable unless made of heavy lumber. This gate consists of a shallow pit extending across the road, over which is placed a wooden frame, with several crosspieces of 1 by 6-in. lumber at right angles to the road. The outer frame is supported by stakes driven into the ground, and each crosspiece is supported in a similar manner. One stake is driven in each corner of the frame, and two between the corners, these supporting directly both the outside frame and the crosspieces. The latter are placed 4 or 5 in. apart. A slanting post, or wire, extends from each side of the gate to the top of the adjoining fence, and thus prevents the animals from getting through without going over the pit.

**This Simpler Type of Gate Is Merely a Framework of Planks Set on Edge, So as to Give No Footing for Cattle**



**A Gate Consisting of a Pit with Two Narrow Bridges over It, to Fit the Tread of the Car, Permits More Comfort for the Motorist**

The principle of this gate is the same as that of the cattle guard at a railroad crossing. Animals are naturally shy of holes or pits, and the crosspieces with their intervening space do not offer an inviting path for the animals to venture on. The automobile can be driven over safely, though this type of gate is a little rough for the occupants of the car. The gate shown in the illustration had broken down at one end because of a heavy load, and hence the need for heavier material in building it: probably 2 by 6-in. timbers would not have broken. The pit beneath this gate was shallow enough so that the broken end did not impede traffic. A more permanent construction for this gate would be to make a concrete foundation around the pit, and on it, parallel with the road, to place two heavy crossarms or joists to support the crosspieces.

The other gate, which is more satisfactory to the motorist, because of its smoothness, and should be just as satisfactory in preventing cattle from going through, is shown in the second photograph. This type is also more permanent. The pit for such a gate should be at least 2 ft. deep. This one has a concrete wall



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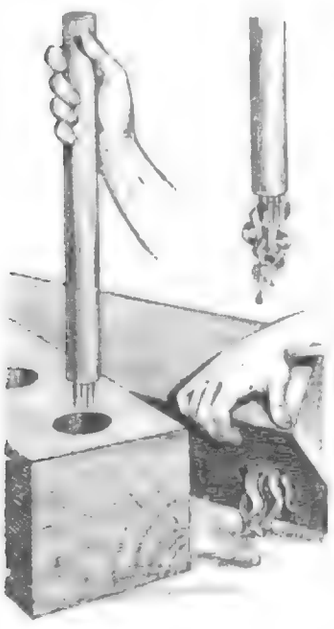
built around it. On each side is a treadway or trough, about 1 ft. wide, with protectors on the side, and covered with boards. These treadways are the proper distance apart for a standard-gauge vehicle to pass over. The width of the gate the other way is 3 or 4 ft., or wide enough to prevent an animal from jumping the pit.

Careful driving is necessary to pass such a gate, but it is perfectly smooth. The pit is in plainer view to the animal in this type of gate than in the one previously described, and the treadways on which the car passes are so narrow and so close to the side posts that the animals would have to be extremely surefooted to cross this gate without being brushed off into the pit.

Of course, neither of these gates can be crossed by horse-drawn vehicles, and therefore an old-style gate is placed at the side of every automobile gate.

### Removing Shavings from Deep Auger Holes

Bridge builders, and other workmen who find it necessary to bore rather large and deep holes in timbers, will find the tool illustrated very useful in removing shavings from the holes. It is merely a straight round stick slightly smaller than the hole, with four or five six-penny nails driven into one end of it so as to leave about 1¼ in. protruding. The heads are cut off and the ends filed to a point.



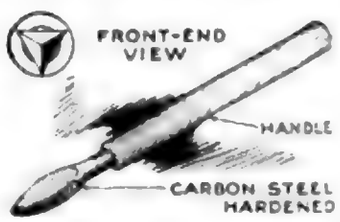
The tool can be used in two different ways. If the timber is loose, and light enough to be readily turned over so as to let the shavings fall out, the tool will be of use in breaking up these chips or shavings so that they will readily fall. To do this, thrust the tool into the hole and revolve it a few times, while pressing it against the chips in the bottom. This will break and tear them so that they will more readily fall out when the timber is turned to the proper position. If the hole cannot be turned so that the chips will fall out, they can be largely removed by thrusting the tool straight into the hole, so as to catch the shavings on the prongs, and carefully withdrawing it.—J. C. Bailey, Peru, Ind.

### A Simple Rack for Draftsmen

At different times a draftsman needs a large number of tracings and blueprints for reference, when working on a single job, and unless he has them arranged in a systematic way, he loses a good deal of time in picking out each sheet as needed. In addition, he has little room to work if his table is covered with a pile of drawings, and his difficulties are seriously increased if he is engaged on the kind of map work in which one job is continued from sheet to sheet. A handy rack which takes up little room can be made out of a 2-in. plank, about 1 ft. square. Plane and sandpaper it, and drill sixteen 1-in. holes—four to a row—which should be enough for most purposes. Sandpaper the inside of the holes, varnish or stain the block as desired, and mark numbers neatly against the holes. The rolled drawings can then be placed in the holes, so that they will take up little room, and will be easy to pick out. Drawings usually have numbers assigned to them for classification on the drafting-room records, but for this purpose it will cause no confusion if temporary numbers are given to the different sheets, corresponding to the holes on the board. The numbers can be written lightly in pencil on the backs of the sheets, and can be erased afterward.

### Three-Edge Ink Eraser

An ink eraser that possesses several advantages for the draftsman is a small three-sided scraper. It is made from a piece of drill rod, and hardened. The faces are then ground, and the edges finished on an oilstone.



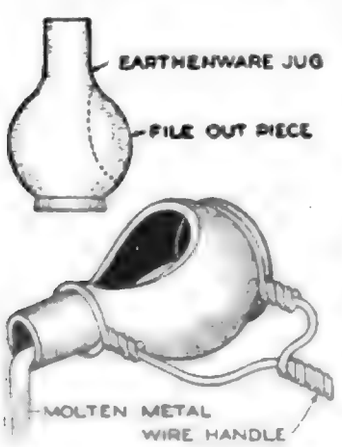

It possesses the advantage of being able to remove ink quicker than a rubber or sand eraser with a shield, and it also permits removing a smaller portion of a line without touching the surrounding lines. It will be found as sharp and efficient as a penknife, but will not dig in and cut the paper or destroy the fibers, as a knife will.—S. B. Royal, Baltimore, Md.

### Poultry-House Walls Reinforced with Straw for Winter

A good way of giving poultry additional protection against cold during the winter months is to reinforce the wall of the poultry house with straw, on the side most exposed to the wind. Drive two or three posts into the ground about 16 in. from the wall, and stretch wires between the posts, spacing them about 4 in. apart. Start the job at the bottom, and when three or four wires have been put up, tamp straw in tightly between the posts and the wall, until the straw reaches the uppermost wire. Then add more wire until the desired height is reached, and tamp in straw up to the top. In the spring, the wire can be removed and the straw taken out, the posts being left ready for the next winter.—W. A. Goodman, Glencoe, Okla.

### Earthenware Vase as Melting Ladle

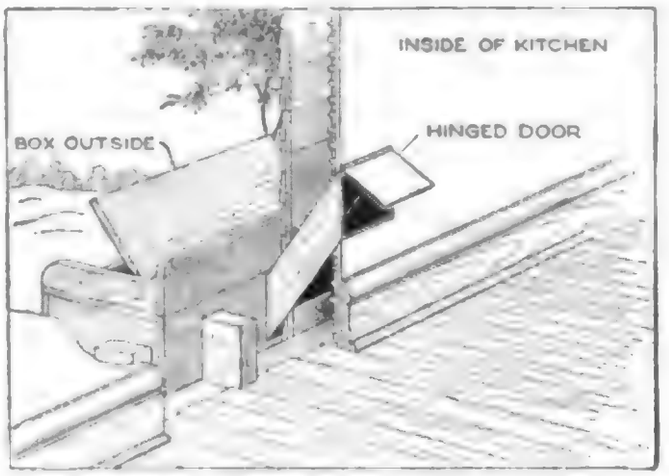
Requiring a small melting ladle with a spout, and having none at hand, a mechanic made one out of a small earthenware jug. He cut away part of the side with a file, to make an opening for filling, and improvised a handle out of a stout piece of wire, bending it double, and forming loops or rings at one end, to hold the neck and base of the jug. A piece of garden hose was slipped over the end, to protect his hands from the heat caused by melting the metal over an open flame.—Harold E. Benson, Boulder, Colo.




### Junk Receptacle Handy to Kitchen

The housewife takes so many steps in preparing meals that any device which saves her a few trips is very welcome. Carrying tin cans, broken glass, or other "junk" to the usual box or barrel at the back of the lot is a disagreeable task. The receptacle shown in the drawing will save all such trips, it being necessary to empty the large box by wagon only once in several months.

A trough, about 4 by 8 in., is set in the kitchen wall at such an angle that nothing will be likely to catch in it and clog it. The upper opening is closed by a small door, hinged at the top, which should have a knob, for convenience in operating.

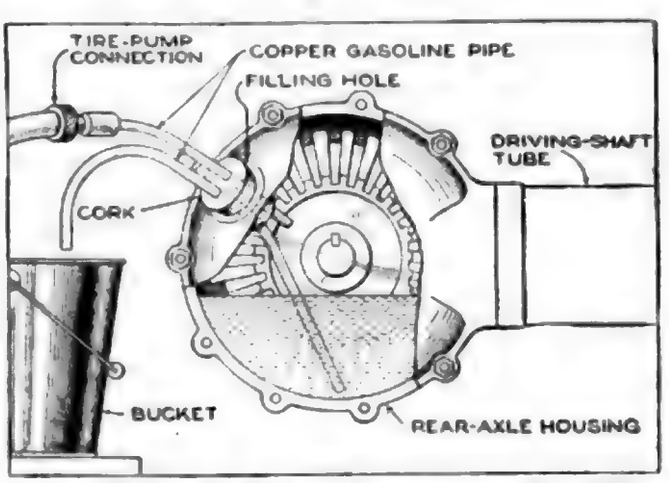



**A Device Especially Appreciated in Winter Is a Chute for the Disposal of Tin Cans and Glass**

The lower end of the trough opens into a large box, with a hinged lid, placed against the outside of the kitchen wall. If this box is carefully made, and is painted, it will not detract from the appearance of the place. It can readily be made into a comfortable bench, and no one will suspect its humbler use. But the main thing is that the device saves many steps.—J. Horace Van Nice, Waukon, Ia.

### Removing Grease from Rear Axles

The necessity of removing and replenishing the grease in the rear axles of cars, where no drain is provided, caused a garage mechanic to devise and construct the following simple arrangement,




**A Cork, Fitted with Two Tubes and a Tire Valve, Provides a Ready Means of Draining the Rear-Axle Housing**

which facilitates removal and permits flushing out of the housing thoroughly with kerosene.

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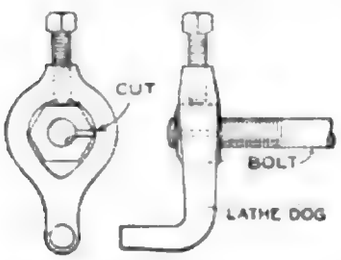
It consists of a cork and two pieces of copper gasoline pipe. The device is used with a tire pump; the end of a discarded tire valve is soldered to one pipe for connecting to the pump hose. The other pipe almost touches the bottom of the housing, so that the pressure will force practically all the grease up through it.—G. A. Luers, Washington, D. C.

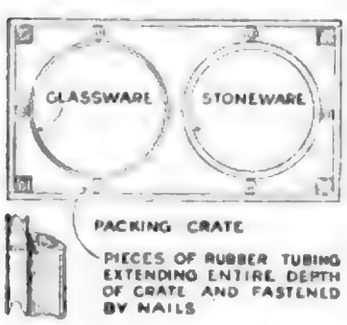
### Gripping Threads with a Lathe Dog

When a round piece has to be gripped by a lathe dog, and it is not permissible to cut a flat on the end to give a footing for the dog, it is possible to get a good grip by using a spring bushing between the work and the dog. In the case of a threaded bolt, a good way is to slot an ordinary steel nut of the proper size, sawing through one of the angles of the hexagon. The nut thus forms a suitable bushing, having threads inside to grip the bolt thread, and flats outside to take the dog.—Joseph F. Convery, Worcester, Mass.




### Old Rubber Hose for Packing Fragile Objects

When packing glass or earthenware jars of cylindrical shape in a wooden box for shipment, it is a good plan to use pieces of an old rubber hose as buffers. They can be nailed against the sides of the box, as shown, so that they assist the excelsior, or whatever packing is used, to prevent breakage. The piece of hose between the jars is held in position by the tightly packed excelsior; or, if a still safer packing is wanted, the piece can be slit through at two or three points, and thin strips of wood fastened across the box, so that they pass through the slits at right angles to the hose, and hold it securely. The latter method should be avoided, if possible, as the strips would make the tubing more rigid.—Roy H. Poston, St. Francois, Mo.



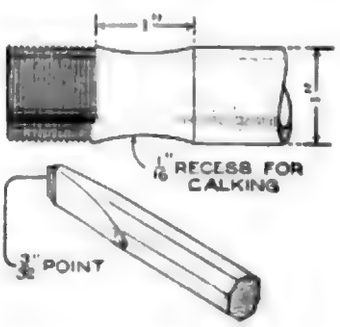

### Warming-Closet for the Kitchen

Remembering the many times when food has to be kept warm for belated guests, a housewife had the closet beneath the cupboard in her kitchen equipped with shelves which consisted of radiators through which passed hot water from the house-heating system. The radiators were suspended on hooks provided for the purpose, and the closet was built so that it would close tightly. The result was a very effective substitute for a range provided with a warming-closet.—Dale R. Van Horn, Lincoln, Neb.

### Steam Pipe Calked into Cylinder

A steam cylinder in a sawmill had a 1-in. steam inlet, the threads of which had become partially stripped, so that steam persisted in leaking out around the nipple, even when the latter was a newly threaded one, treated with white lead or graphite.

There was not enough metal to drill and tap the hole to take a 1¼-in. pipe, so the following plan was tried: A nipple was made with a thread somewhat larger in diameter than the standard; just at the end of the thread the nipple was ground concave for a distance of 1 in., and to a depth of 1/16 in. A 1-in. pipe tap was screwed into the hole in the steam chest, until it touched bottom. Then the nipple with its fittings was screwed in until the concave part entered well into the hole in the steam chest. This left a crack all around the nipple, which was calked with two turns of No. 18 gauge soft-copper wire. The wire was driven in with a special calking tool made by grinding a ⅜-in. flat cold chisel to the shape shown in the cut. The result was a permanent steam-tight joint.—R. C. Bradbury, Elizabeth, La.




¶A telegraph clerk who received many messages by telephone, used a head set with a watchcase receiver to act as auxiliary to the regular receiver, which he also connected to the head set. In this way he had a receiver at each ear, and practically eliminated the danger of misunderstanding a message.

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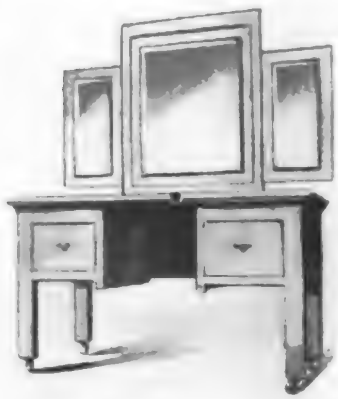
# How An OLD-FASHIONED DRESSER Was Modernized

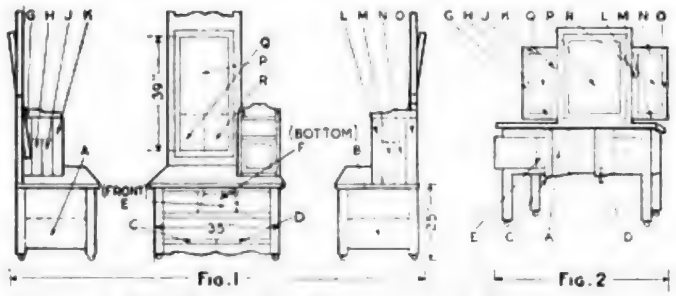
By Mrs. Ruth Darling Shultis



THE dresser with the long single mirror, shown above at the left, belongs to a type which is not entirely up-to-date, and the owner wished to replace it with a more modern piece of furniture. To avoid the expense of purchasing a new one, he took the old one apart, and, without using any new lumber, made a dressing table of modern design equipped with three mirrors, as shown in the photo to the right. Nothing was purchased except brass angles and screws to hold the side mirrors, brass handles of modern pattern, and enough paint for three coats, the total expense amounting to less than a dollar. It was necessary, of course, to use caution in separating the parts of the old dresser, which had been dovetailed and glued together; but by unsealing the joints carefully it was accomplished without breakage.

The line drawings in Figs. 1 and 2 indicate the manner in which the material was rearranged to form the new dresser. The old one was not completely dismantled, as some of the framework was needed in the new one without any change in construction; but the mirror was altered beyond recognition. In the drawings, each letter indicates a part of the old table, which was used in a new position on the new one. Fig. 1 shows the locations in the old piece of furniture and Fig. 2 those in the new one, with the exception of pieces B and F, which are not visible in Fig. 2, but are used in positions corresponding respectively to A and E. The frame of the central mirror was secured on the new dresser by means of wooden strips screwed to the back. The old mirror had swung on trunnions in an outer frame, and it was similarly attached on the new table, after the uprights had been shortened and the carved decoration had been removed from the top. The same trunnions supported the altered center mirror, and the small mirrors were fastened to each side of the central frame by brass angles screwed to the top and bottom.

To brighten the appearance of the dresser, a coat of flat white was applied, followed by two coats of white enamel, each coat being allowed 24 hours to dry. This enameling was necessary to the complete transformation of the dresser, as the modernity of the new design was out of harmony with the somber tones of the obsolete model. The table top was slightly below the level usually found on modern dressers, but familiarity with the old dimensions made the owner averse to a change.




To the Left is Shown the Dresser before Alteration; to the Right Is the Finished Dressing Table. The Letters Indicate the Old and New Positions of the Various Pieces

¶Tin cans as hub caps are not a very decorative addition to wagon or buggy wheels, but they have been used on very muddy roads to keep dirt out of the bearings. The can is placed over the hub, and held in position by wood screws driven into the hub through holes punched in the sides of the can.



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### Flagpole Protected by Creosote

At one of the U. S. submarine bases on the Pacific coast there is a tall wooden flagstaff which was threatened by the decaying of the wood near the base. An

This Naval Flagpole was Saved from Decay and Boring Worms by a Creosote Treatment Applied through a Pipe

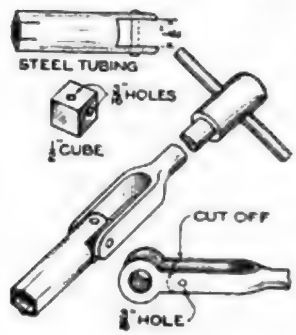
attempt was made to preserve it by building a large concrete cone extending several feet underground, but this did not seem to put an end to the rotting of the wood. Members of the sub-base repair crew examined the pole, and learned that the trouble was partly due to the ravages of the damp sea air and partly to the gradual consumption of the wood by a species of minute wood-boring worms. A hole was therefore bored into the pole obliquely, and almost through it, from one side to the other. A 2-in. iron pipe was then driven into the hole, after being drilled with small perforations over its entire surface. Creosote was poured into the pipe, and a screw plug fitted in the end, as shown in the photograph, so that the preserving chemical was distributed through the entire center of the pole, gradually working its way down through the grain of the wood. After the pipe had been filled with creosote five times, no signs of further decay were observed. The pipe has been left in the pole for a repetition of the treatment, should it be found necessary; but the pole is not likely to decay further, now that it is thoroughly saturated with creosote, and the chemical seems to have completely exterminated the worms.—John E. Hogg, Los Angeles, Calif.

### Rawhide Shaft Coupling

A machinist found it necessary to couple a motor shaft with a pump shaft, so that the drive would be direct. The coupling at the end of each shaft was provided with a disk, or flange, with bolt holes drilled through it, so that it could be bolted to a corresponding flange on another coupling. In this case, however, the flanges did not match, one of them having six bolt holes and the other four; and the circles forming the center lines of the two rings of holes were not of the same diameter, so that none of the holes on one flange came opposite a hole on the other. In addition, the two flanges could not be brought within half an inch of each other. The problem was solved by filling up the gap between them with a rubber disk, or gland, taken from an old pump, and tying the couplings together with rawhide belt lacing. The lacing was passed in and out of the bolt holes, and outside the circumference of the rubber gland; and by using a large quantity of lacing, and fastening it securely, an excellent connection was made, which did duty for several months without giving any trouble.—G. L. MacLean, Robertsonville, P. Q., Can.

### Universal-Joint Socket Wrench

Many an awkward job is made easy by using a socket wrench provided with a universal joint. To make a wrench of a given size, heat a short piece of steel tubing, and drive a nut of that size into one end of it, swaging the tube to the right shape. Cut the other end, as shown, and drill holes through both jaws. Then cut the eyes off an automobile brake-rod clevis, and, after rounding off the edge, drill the remaining part of the fork; in this way the tube and clevis will form corresponding yokes of the universal joint. To connect them, use a square block of iron which will make a fairly loose fit in both

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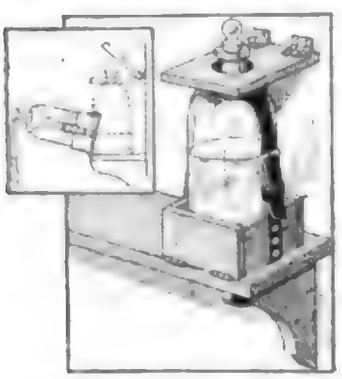
forks, and drill two holes through it, as shown; these holes must be at right angles to each other, and must both be off center, to prevent them from intersecting. Then pin all three parts together, and the working end of the wrench is complete. There are various ways of making a handle, but a fairly good one is formed by flattening the end of the clevis arm, fitting a collar over this end, and making it tight by flattening with a hammer. A short piece of rod is then passed through a hole drilled in the collar.—W. C. Reichard, Syracuse, N. Y.

### Hinged Rack for Bottles

In laboratories, photographic studios, drug stores, and other places where large bottles are constantly used, the labor of taking them down from shelves and returning them is a fatiguing part of the day's work. If, on the other hand, they are kept on the floor under a bench, a good deal of effort is required to lift them, and they are likely to be broken by an accidental kick. To remedy the trouble, make a wooden box just large enough to hold each bottle, and fasten it to the shelf by hinges. Place the bottle inside it, and secure it by means of a leather strap, which fits over the shoulders of the bottle and is fastened to the box by screws. A wooden safety collar is hinged to the wall, and is dropped over the neck of the bottle to prevent it from falling forward by accident. When the bottle is to be used, the safety collar is raised, so that it can be tilted forward, as shown in the small detail drawing.—Albert E. Jones, East Milton, Mass.

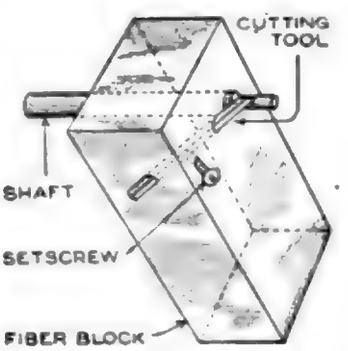


### Saving the High-Speed Steel

The expense of using tool steel can be greatly reduced if each tool is used until all the material is worn away. This is made possible by using cheaper material with it. When the tool gets too short for further use, weld it to a piece of bar stock of the same diameter. A tool can be welded to both ends of the bar, which can be used for the same purpose many times.—Jack Solon, Natchez, Miss.

### Metal Turning without a Lathe

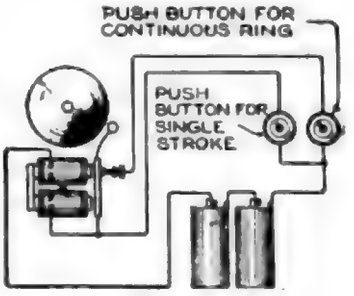
The sketch shows a handy method of turning a shaft without using a lathe. The shaft is passed through a block of fiber, which is sufficiently regular in shape to be held securely in a vise. Drill a hole through the block, large enough to admit the shaft without allowing side play when it is revolving. Drill another hole in the side of the block, as shown, to admit the cutting tool, and when it has been adjusted for operating, hold it firmly in position with a setscrew. To revolve the shaft, hold it in the chuck of a breast or hand drill, and turn it against the tool. The latter should be so adjusted that it will bring the shaft down to the right diameter at the first cut.




This method has given very good results on brass rods. It is not absolutely necessary for the block to be of fiber, but the material should be hard enough to prevent enlargement of the hole which is used as a bearing for the shaft.—Philip G. Bernholz, East Orange, N. J.

### Bell Rings Either Continuously or by Single Strokes

It is often convenient, when installing a large electric bell in a shop, to connect it so that it will ring either continuously or by single strokes. For instance, a certain number of strokes may be a call for a certain employe, while a continuous ring may be a danger alarm, or a signal to quit work. The bell is connected as shown in the diagram. When the single-stroke button is pressed, the circuit is completed through the electromagnets, and current flows continuously until the button is released, thus holding the armature down and not permitting it to vibrate. When the other button is pressed, the circuit is broken with the usual vibrating motion, ringing continuously as long as the button is held down.

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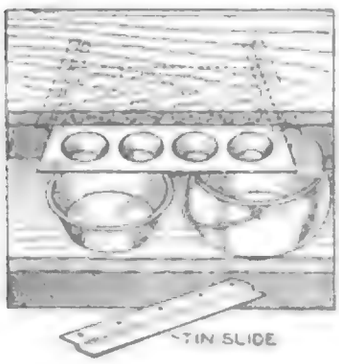
### Linoleum Riveted to Auto Mat

The rubber mat of a car becomes worn under the driver's heels before the rest of the mat shows any wear, and gives the mat an untidy appearance. The life and good appearance of the mat may be materially lengthened by riveting a piece of heavy linoleum in the space under the driver's heels, as shown in the photograph. A smooth, neat job may be done if bifurcated rivets are used, which will leave no projections to rub on the floor boards.—Harvey Mead, Scranton, Pennsylvania.

### A Rack for Cooking Utensils

Sometimes the housekeeper with a limited amount of kitchen space is at a loss how to dispose of her cooking utensils. This particular method of stowing away gem pans, and other flat tins, will then prove valuable. Secure several narrow strips of tin, as long as the width of the shelves in the pantry, and bend them as shown. Nail these to the undersides of the shelves, just far enough apart to form slides to accommodate the different-sized pans. Thus all flat tinware can be easily and conveniently placed out of sight, and yet can be quickly reached when needed.—L. B. Robbins, Harwich, Massachusetts.

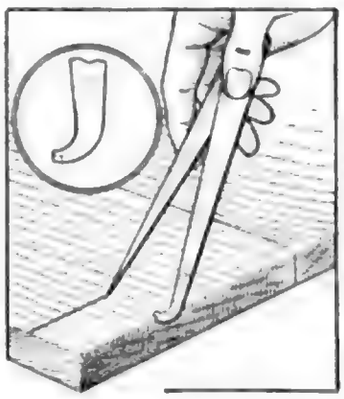



### Squash Keep Better When Coated with Shellac

Many people have trouble keeping winter squash without spoiling. By preparing them properly, they may be kept as late as June or even July. Pieces of barrel stave, or other board, should be placed under each growing squash, so that it is not in contact with the ground. This insures the shell being in uniformly good condition. When frosts threaten in September, pick the squashes and place them on a platform in the sun, where they will become hard and dry. They must be covered at night to protect them from frost. When hard, they should be given a coat of shellac. Others may be kept for some time by placing them on a shelf in the cellar near the furnace, where they will become dry within a fortnight. If they are then removed to a moderate temperature, they will keep for some weeks without shellacking, but those to be kept long after Christmas must be given a heavy coating, or they will not keep.—J. T. Bartlett, Ft. Collins, Colo.

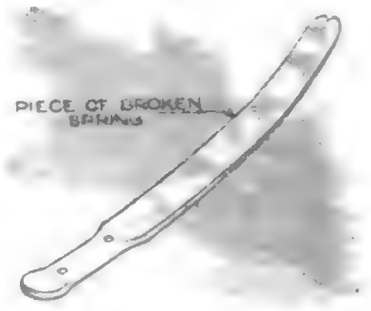
### Shoulder on Hermaphrodite Calipers

To insure accurate work, a mechanic filed a square notch in the curved leg of his homemade hermaphrodite calipers, so that it could not slip. The leg was made unusually broad, for this purpose.



### Tool Made from Auto Spring

A tool of the kind shown in the sketch can be made from the broken spring of an auto or buggy. Cut a 16-in. piece from the end of one of the leaves, and make a small sharp-cornered notch at the thin end. Then form a handle at the thick end by grinding or forging, and the tool is made. Its usefulness lies in the ease with which it can be inserted into the narrowest space, to obtain a leverage for removing box lids, boarding, paneling, and even metal plates; and it is therefore valuable to the machinist as well as the carpenter. It is particularly handy in loosening wainscoting and finished woodwork in places where it would be dangerous to use a chisel or crowbar; and by means of the notch at the end, nails can be pried loose in awkward corners where no other tool can be handled.—Henry Simon, Laguna Beach, Calif.



### Emergency Light for Tire Work

It is not uncommon for a motorist to be stalled at night with tire trouble, and to find himself without a trouble lamp. When in such a situation, scrape together a small pile of sand, pour ¼ pt. of gasoline upon it (about a cupful), and touch a match to it. It will burn for 15 or 20 minutes, and will provide sufficient light for an ordinary tire-repair job. It is even practical to carry a small can of sand under the seat or in the tool box, if the car is not equipped with a trouble lamp. Caution is necessary, of course, in using this expedient. Keep a reasonable distance between the burning gasoline and the car—especially that part of it where the gasoline tank is mounted.—John Madlena, Standard, Ill.

### Grass Mat for Working on Ground

For doing work on the ground, such as in the garden, it is well to have a mat to put under the knees when the ground is wet. Mats made of cloth, or even carpet, will get wet in time, as the moisture is absorbed from the ground. A type of mat which is proof against this is made from long grass. To make it, lay out four or five bunches of grass, about 3 in. in diameter. Tie around the first bunch several pieces of long binding twine, placed about 1 ft. apart; then add the second bundle, like the first, and tie the twine also around it. After as many bunches as desired are tied together, run twine around the whole mat, sufficient to hold it together. Such a mat is good for a whole season's service. I have used one

**A Mat Made from Bunches of Long Grass, Tied Together with Twine, does Not Absorb Moisture**

many a day in nursery work, principally when budding trees. To make the mat I used slough grass, about 8 ft. high.—F. E. Dougan, Pawnee, Okla.

¶When tracing a blueprint, provide a duplicate of it for reference, if possible.

### Mail Boxes on Buggy Wheel

Farmers in several different parts of the country have discovered a way in which they can make use of an old buggy

**An Old Buggy Wheel and Axle, Set Up in This Way, Provide a Great Convenience to the Rural-Mail Carrier**

wheel, and at the same time furnish a great convenience to the rural-mail carrier. Several mail boxes are mounted on the wheel, which is set up at a convenient spot on its axle. The axle may be set in a concrete base, or merely driven into the ground. The mail carrier, rotating the buggy wheel, can bring each box in turn into the most convenient position for inserting the mail.

### Producing Small Hyacinth Bulbs

Experiments by nursery gardeners have developed a method of making one hyacinth bulb produce several. When the bulb is fully ripe, divide it with a knife in such a way that the part which contains the shoot will be conical in form, and the other part will show a cavity corresponding to the shape of the cone which has been cut away. The hollowed portion must be covered with soil containing very little moisture, and in about a week a large number of small bulbs will appear. Pull these away and place them in soil, where they will grow to full size and eventually produce flowers.

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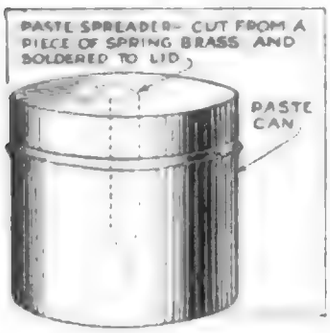
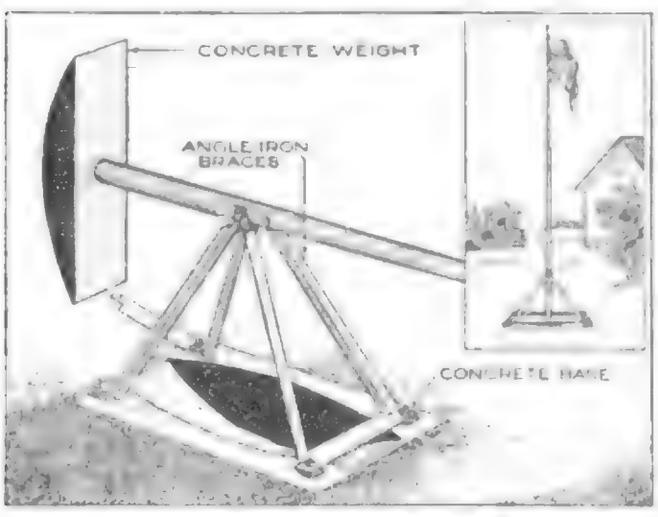
### Dipper for Soldering Paste

The small tin cans which contain soldering flux in paste form are very convenient to carry, but whenever the paste is to be applied to a joint it is necessary to use a sliver of wood, or something similar, to spread it. This is usually thrown away after it has been used once or twice, and as a quantity of paste generally clings to it, the result is considerable waste. Time is also lost in hunting for a new sliver whenever paste is to be applied, and if a chip of wood is kept in the can, it gets completely covered by the paste, which makes it very awkward to handle. It is a good plan, therefore, to solder a strip of thin brass, or other metal, to the lid of the can, as shown in the sketch. The lid then serves as a handle, the fingers are kept clean, and no paste is wasted.—J. A. Weaver, Baltimore, Md.




### Flagpole Easily Lowered for Repairing

After a flagpole is once set, it is often sadly neglected on account of difficulty in taking it down or getting an expert to climb it, which involves quite an expense. To make it easy to paint or repair a flagstaff of either wood or steel, a mounting is suggested which allows the pole to be easily lowered to the ground, and raised again by means of a concrete counterbalance at the base. The pole is mounted, at a suitable height, on brackets formed of angle iron, as indicated in the drawing, and set on a concrete base. The counterweight should be nearly sufficient to balance the weight of the upper part of the pole, and may be held securely in position, when the pole is raised, by iron bars set across the bolts which fasten the frame to the concrete base.

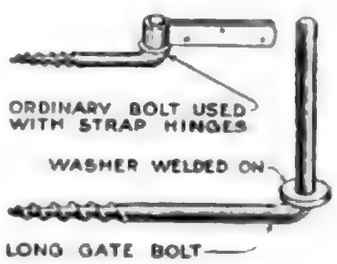



When Repairs Are Necessary to the Flagpole, It Swings on a Pivot to a Horizontal Position

To avoid damage by frost, the pit in the cement should be shaped so that the two sides are slanting and not parallel to each other, as indicated. In case of water collecting, between the counterweight and the base, and freezing, the expansion will merely raise the pole and counterweight a short distance. To permit this, the hole through the flagstaff, for the bolt on which it turns, should be slightly elongated vertically, so that the pole can slide up and down on it for perhaps ½ in., but cannot work back and forth in a horizontal direction when a high wind is blowing.

### Long Hinge Bolt Holds Gate Securely

Among the troubles of a middle-western farmer was a gate which came off its hinges whenever it was raised a short distance above its usual position by a heavy snowfall, or any other cause. It swung on a strap hinge, and the vertical arm of the bolt which held the strap was so short that even a slight jerk was sufficient to lift it off the bolt. To make it more secure, a long bolt was made by heating a rod of the required diameter, and bending it to the necessary shape, after which a washer was welded on, as shown in the sketch, to make a bearing for the strap.




### Heated Watering Trough for Cattle

As all dairymen know, their stock should not be obliged to drink ice-cold water. Comparatively few provide their animals with individual bowls, and so they must be allowed to drink at a trough. Ice will usually form on such a trough almost anywhere through the northern part of the country during winter, unless some means are employed to prevent it. Stoves have been built water-tight and submerged, but they are liable to give trouble.

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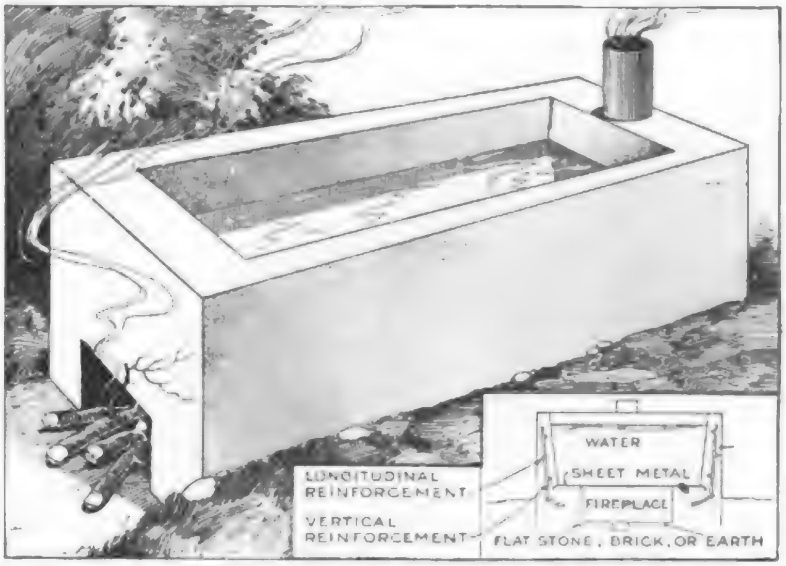
A concrete trough having a heavy sheet-metal bottom, under which an open space is left for a fire, solves the problem very satisfactorily. The manner of constructing such a trough is shown in the drawing. In building it, after the foundation has been prepared in the usual way, the outer form and the inner one for the fireplace are set up, and the space is filled with concrete up to the level of the bottom of the trough. The metal bottom, which should have been previously prepared, is then laid in place, and the inner form for the trough set on top of it. Then proceed to fill the forms with concrete. The whole should, of course, be well reinforced, particularly at the corners.




**A Trough Properly Built for the Purpose, Chiefly of Concrete, Greatly Simplifies the Problem of Warming the Drinking Water for the Stock in Wintry Weather**

The metal bottom should be made of heavy galvanized iron, riveted and soldered if of more than one piece, with the edges bent over to insure a better grip in the concrete. If a very wide place is left for a fire, there should be metal supports laid in the concrete, for the metal bottom to rest upon.

One end of the fireplace should of course have an opening large enough for firing, and the other end of the structure should be made sufficiently thick to allow the building in of a length of galvanized pipe, made of suitable size at the top to take ordinary stovepipe, if the latter is required to provide draft. Pains should also be taken to reinforce the concrete around the pipe very carefully. A little fire built under such a trough on cold days will quickly warm the water sufficiently, and this heat may be retained for some time if a wooden cover is used to put over the trough while the stock is stabled.

Any waste material, such as old, broken boards, small dead limbs gathered from the woods, etc., may well be used to burn in the fireplace.—Arthur J. Dunckel, Dolgeville, N. Y.

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### Kinks for Bank Protection

Newspaper accounts of the robberies of small banks indicate that the procedure of the burglars is in many cases the same. The watchman, or any person likely to resist the robbers, is imprisoned in the vault, or some secure place, and remains there until he is delivered by a chance visitor, or at the resumption of business on the following day. The same thing often happens in stores and residences, the victims in these cases being locked up in ice boxes, cellars, or cupboards, while the marauders loot the premises and make good their escape.

These cases are so common that it would seem practical to place a bell switch in the vault or cupboard in which the robber would be most likely to imprison his victim, so that, if not unconscious, the prisoner could sound an alarm which would arouse the neighborhood. Judgment would, of course, be used in selecting the location, and the existence of the switch should be revealed only to persons with whom the secret must necessarily be shared. As the hands of the prisoner are likely to be tied, the switch should not be more than three feet above the floor.

A mirror set at an angle at the rear of a teller's cage is a medium of protection already adopted in some country banks. It enables a teller to observe all the movements of a visitor, even with his back turned to the window, and, being set at an angle, is not conspicuous enough to warn a would-be thief.—Alva Dunlap, Des Moines, Ia.

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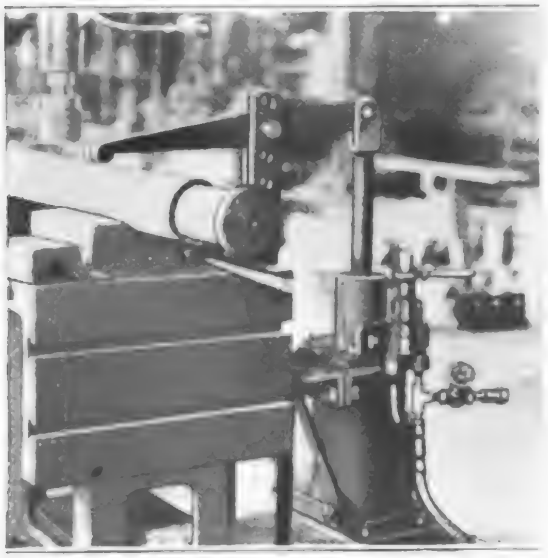
### Air Clamp on Drill Press

In the average railroad shop the ingenious mind has plenty of opportunity to exert itself. The photograph shows



**The Air Tank and Brake Valve from a Street Car are Made into a Powerful Pneumatic Clamp for the Shop**

how an air cylinder, removed from a braking system, is used in connection with an ordinary street-car motorman's valve to form a powerful clamp. The lever arm is bolted at one end to the upper end of the piston rod, and its center is pivoted so as to form an adjustable fulcrum. The other end holds the work firmly down on the V-block for machining. To release the clamp, the air valve is opened, and the clamp raised by a light touch with the hand.—Ralph O. McGraw, Chicago, Ill.

### To Keep Films Pliable

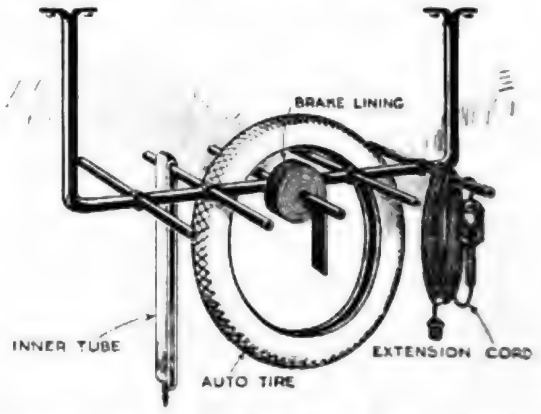
If moving-picture film is allowed to remain unused on the reel for a week or more, it tends to get hard and brittle, so that cracks are likely to occur in many places on its surface the next time it is run through the projecting machine, even if it does not get torn apart. An easy way to make the film soft and pliable is to run it through two rollers tightly pressed together, and for this purpose an ordinary typewriter can give good service. The film is fed into the typewriter between the rollers, and as it comes out it is rewound on an empty reel. Another way of softening the film is to keep a moist piece of rag or blotting paper fastened to the top of the case on the inside. —Philip A. Wall, Bedford, Mass.

### Auto Exhaust Kills Ground Squirrels

Ground squirrels are one of the worst pests the farmers have to deal with. One way of exterminating them is by the use of exhaust gases from an automobile. This is done by connecting a length of hose to the exhaust pipe of the car and placing the free end down the squirrel hole. Earth should be packed around the hose to prevent the escape of the gas. The engine is then started, using as rich a mixture as possible. It is even advisable to use a fuel composed of half kerosene and half gasoline. The gas thus forced into the hole will be seen coming out of the other holes, sometimes at a great distance, but the squirrels are killed before they can escape.—W. L. Williamson, San Francisco, Calif.

### Overhead Rack Made of Pipe

The type of rack here shown provides a handy place to hang spare tires and other automobile parts, and is very easily constructed out of lengths of pipe and a few bolts. The main hanger is made from a piece of 1-in. pipe, with flanges at each end to fasten it to a beam overhead. To form the flanges, saw each end of the pipe to a depth of about 4 in., bend the divided parts through a right angle, flatten them, and drill bolt holes through them. Then bend the hanger to form three sides of a rectangle, using the long side to support the crosspieces, which are short lengths of ¾-in. pipe. Cut slots in the main hanger to admit the crosspieces, and cut corresponding slots in the latter, so that they will fit snugly. Then




**A Rack, Made of a Few Pieces of Pipe, Enables a Garage Keeper to Hang Tires and Spare Parts within Easy Reach**

bolt the crosspieces in position, and fasten the hanger overhead with screws or bolts of suitable size.

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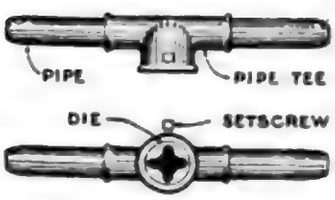
### Homemade Picture Puzzles

Most children are familiar with the puzzle pictures which are composed of a number of disconnected parts. A child soon gets tired of the same picture, but an amateur photographer can renew the puzzles indefinitely with landscapes, preferably with human figures or animals in the foreground; and a good enlargement, if mounted on cardboard and cut up into small parts, will give a child a great deal of entertainment. A better job can be done if the enlargements are mounted on thin boards and cut up with a jig saw. Do not make the puzzle too difficult, as this will only perplex the child and diminish his enjoyment. The more prominent objects in the picture should be fairly easy for him to trace from one fragment to another. A good way of introducing him to the game is to start him on a large portrait of some relative, so that the familiar features may serve as a guide.—Abel Green, New York, N. Y.

### Die Stock from Pipe Fittings

A pipe tee with the central portion bored out and enlarged, so as to hold a small die, has been found an excellent makeshift for cutting threads. A small hole is drilled and tapped at one side, to take a setscrew, and two short lengths of pipe are screwed in at each end, to serve as handles. The ends are rounded off with a file, or in the forge, giving the hands a smooth grip.




### Holes Drilled in Auto Frame Identify Car

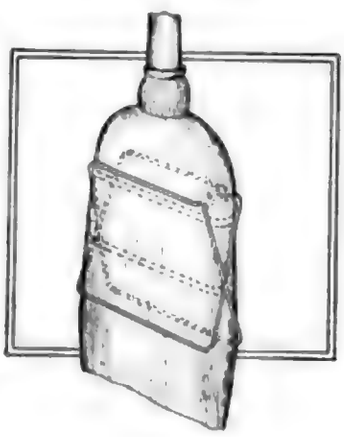
Automobile thieves make a practice of disguising stolen cars to prevent subsequent identification. Most distinguishing marks can be removed, but the owner's name or initials can be rendered ineffaceable if the lettering is made with 1/16-in. holes, drilled through some part of the frame where the removal of this small amount of metal will not appreciably weaken it. A letter may be, say, 5/8-in. high, composed of lines of five or six holes each, and located the same distance from the top flange of the frame member as from the bottom. If the thief plugs the holes afterward, they can still be detected.

### Self-Closing Nonsagging Gate

Among the most exasperating things that can happen is to have a gate that should be kept closed, continually left open by passers-by, or to have the fences torn down by people crawling through or over. Where such troubles are experienced, the gate pictured will eliminate the difficulty. A hole is bored in the center of each crosspiece so that the gate may be swung on an iron pipe held at the top and bottom. Chains, from the top crosspiece, support the gate at the proper distance from the ground. When pushed open they raise the gate slightly, and its own weight causes it to close rapidly. A strong cross support at the top will keep the fence tight and make bracing of the gateposts unnecessary. Its simplicity of construction and durability are apparent. —A. S. Romig, Boulder, Colo.

### Wire Brace for Worn Broom

Most housewives know how ineffective a broom becomes when the bristles get curled up. A good method of preventing this is to stiffen the bristles with a brace made of a single piece of spring wire, bent as shown.

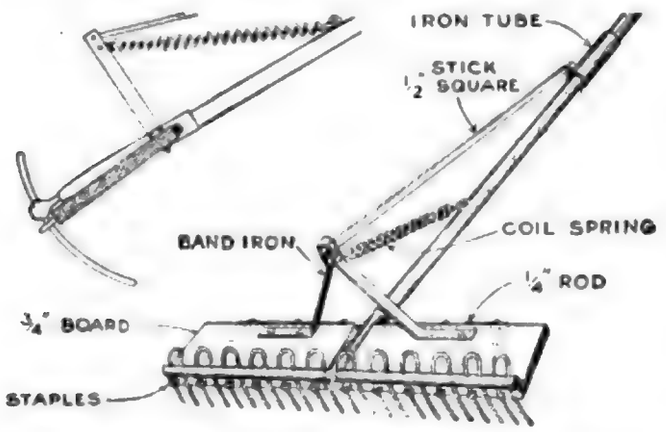


### Steel Colored Blue without Heat

When it is desired to give a blue color to a gun barrel or other piece of steel, and to avoid using heat, clean the metal thoroughly, and cover it with a solution containing ten parts of water and one part of nitric acid. After a bluish shade has appeared, wash it with warm water, using a soft cloth, and wipe it dry. Then rub it well with linseed oil.

### Attachment for Garden Rake Removes Leaves Instantly

Raking fallen leaves would take much less time if it were not frequently necessary to stop and clear the teeth of the rake. This can be facilitated if the head




**The Teeth of a Garden Rake are Inclosed by Movable Metal Loops, Which Free Them from Encumbering Leaves**

of the rake is equipped with a row of metal loops or staples, which fit around the teeth, as shown in the sketch. The staples are driven into two short, flat boards, which project on either side of the handle as far as the ends of the rake. These drop when impelled by a lever, and force out any leaves and other material clinging between the teeth of the rake.

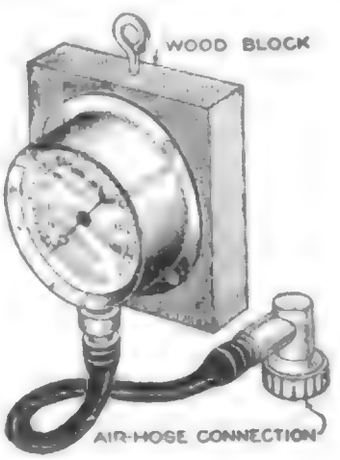
To furnish a rake with this device, drill a hole through the ferrule, from 2 to 4 in. behind the teeth, and large enough to make a loose fit around a piece of ¼-in. iron rod. The rod should be about 15 in. long, and half of it should extend on each side of the ferrule. Each end is bent to a right angle. Fasten one of the short boards to each half with staples; the ends of the rod are sunk into holes in the boards. Then drive large staples into the stick, in such a way that they will pass around alternate teeth, sufficient clearance being allowed to enable them to rise and fall freely when the iron rod rotates in the ferrule. Screw a piece of band iron to the sticks, bent to the shape shown, and fasten a light stick to it with a cotter pin; then attach the other end of the stick to a piece of metal tubing which fits loosely around the upper part of the rake handle, forming a sleeve. The function of the sleeve is to thrust the stick forward, and the band iron with it, so that the two sticks on either side of the ferrule will rotate, and depress the projecting staples far enough to free the teeth of the rake from leaves. A coil spring fastened to the piece of band iron will return the staples to their former position as soon as the spring at the top of the handle is released. A short nail, driven into the handle below the sleeve, prevents the latter from falling too far down.

### Lard-Pail Oat Sprouter

Poultry men who feed sprouted oats to their flocks have difficulty in keeping the feed in the proper condition without going to a great deal of expense. By using wooden lard or butter containers, which may be obtained at a grocery store, the trouble may be easily avoided. A hole is bored in the side of the pail near the bottom, and a wooden plug provided for it. In use, the oat sprouter is filled with oats, the hole is plugged and water poured over the grain. The pails must be kept in a dark, rather warm place, to encourage the sprouting. After the grain is thoroughly soaked, which usually requires several hours, the plug is removed from the hole in the pail and the water allowed to flow out. At least one pail should be kept empty all the time. This makes it possible to change the oats from pail to pail, in order to keep it from molding or otherwise spoiling. This system is both cheap and effective.

### Tire Gauge Not Easily Lost

At an automobile service station on a highway leading out of a large eastern town, the manager was constantly losing his small tire-pressure gauges, which were appropriated by motorists who stopped to inflate tires. To make it difficult for a tourist to slip the gauge into his pocket after using it, the owner equipped his air compressor with a larger model, which was too bulky to be easily taken away. He chose a large-diameter pressure gauge, of the type used on boilers or air compressors, and screwed it to a flat block which was furnished with a screw eye, so that it could be hung from a hook on the compressor. The tire-valve connection was made by attaching a piece of rubber hose and coupling, of the type used for the filling hose.

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# Blanking and Forming with One Punch

By S. B. ROYAL

THE small sheet-metal clip shown in Fig. 1 is an example of a blanking and forming job which can be completed in one stroke of a simple punch and die—that is to say, one embodying neither tandem nor compound construction.

In the figure are shown, first, the general layout of the punch and die, and underneath it a view of the part to be produced. To the left are details of the punch proper and of the die, while below, the punch is shown at various times during the stroke which cuts and forms the part complete. It is necessary to use a strip of stock somewhat wider than the required part, to avoid distortion. As will be seen by examining the successive views in the lower part of the figure, the sharp edges at the bottom of the slanting face A start the cut by penetrating through the stock. The angle to which these faces are ground is such that the stock will round over, or curl, as indicated in the second view. In the third view the punch has moved far enough for the faces B to strike the stock. The curled portion is now completely formed, and at this point the faces B are forced through the stock. This has the effect of cutting the metal only at the edges toward the side of the die, as the edge where faces B and C meet each other does not come in contact with a cutting edge of the die, and therefore cannot cut the stock.

In the fourth view this cutting, by the faces B, of the two flat sides of the part which are opposite each other, has been completed, and these two sides are being squeezed between the faces C of the punch, to bring them just the correct distance apart and parallel to each other. In the remainder of the punch's travel, the face D of the punch severs the completed clip from the stock. The part will remain clamped between the faces C, and will probably have to be forced out during the upward movement of the punch by some device such as the knock-out punch shown in the layout.

The angle to which sides A should be ground depends on the thickness and material of the stock, as well as on the amount of curvature desired on the part, so that it is difficult to give any rules by which this angle can be determined. It will have to be found by experiment until the tool designer has had sufficient experience with this kind of punch. The safe method, of course, is to make these faces longer at first than would seem to be required, as they can then be ground down a little at a time until the correct angle is found to give the desired radius of curvature. The angle can then be

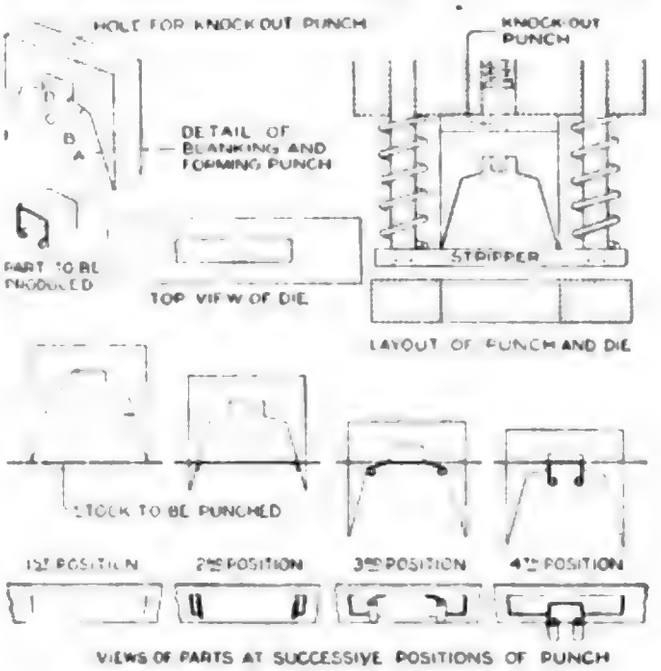


FIG. 1

**A Layout, Two Details, and Four Progressive Views Illustrate the Operation of the Single-Stroke Blanking and Forming Punch and Die**

measured and recorded for use in future design. The faces B can be made exactly horizontal when working in light sheet metal, of thickness up to about .040 in., and clips of this type are seldom made from thicker stock than this. When heavier stock is used, however, it is well to give a slight angle to the faces B, producing a "shearing cut." The angle must be very small, or the curling effect will be produced as with the faces A.

In Fig. 2 are shown a number of other clips, A, B, C, and D, which can be made with this type of tool. In the case of two of them, a suggestion is given as to the form of punch suitable for blanking and forming them in one stroke. In view of the high cost of punch-press tools, this process may be of interest to many shops and tool designers.

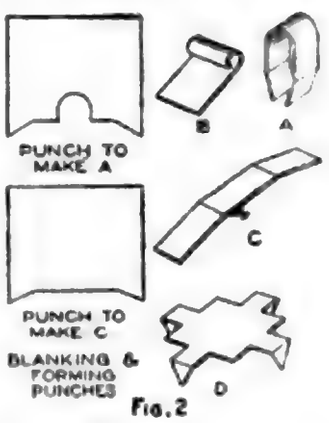


FIG. 2

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¶Many of the cheaper woodworking tools, such as chisels and plane irons, are so soft that nicks can be taken out with a file.



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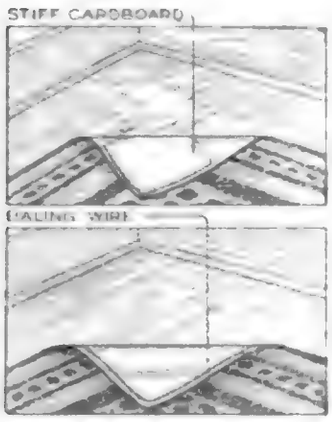
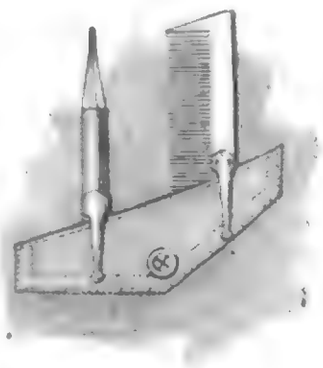
### To Keep Carpet Corners Straight

Two ways are shown here of preventing carpets from curling upward at the corners. One is to sew a stiff square of cardboard under each corner, so that the edges of the carpet will run along the edges of the cardboard. Another method is to use a piece of stiff wire, such as baling wire; a 2-ft. piece is enough. Bend it at a right angle in the middle, and sew it to the lower surface of the carpet, just inside the edge. It will make the carpet lie flat, and if it gets bent upward by accident, it is easily bent back again. —Fred C. Davis, St. Joseph, Mo.



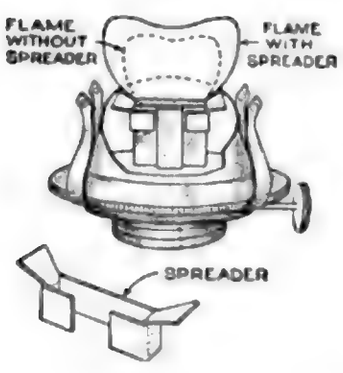

### Pencil Clip Attached to Comb

To avoid the frequent loss of pocket combs, use an ordinary pencil clip with the ring portion cut off. It can be easily riveted to an aluminum comb, and will hold it securely in the pocket.



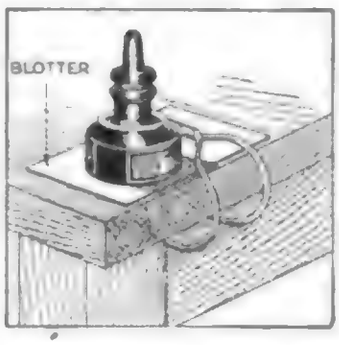
### Flame Spreader for Kerosene Lamps

This simple device will materially improve the efficiency of an ordinary kerosene lamp, without appreciably increasing the consumption of oil. It is placed over the wick tube, and causes the flame to spread. The effect of the wings at the ends is to produce a slight vacuum just above them, which draws the flame outward, producing a larger flame area. The construction is easily understood from the sketch. It should be made of brass, about 1/32 in. thick, and should fit the wick tube snugly, but need not inclose it completely. The exact angle at which the wings are bent, and the distance of the spreader from the top of the tube, will depend upon the shape of the tube and burner, but the right adjustment can be made with a little experimenting.—C. A. Pease, Monrovia, Calif.




### Spring-Wire Ink-Bottle Holder

Some of the devices used for holding an ink bottle steady are liable to scratch the finished surface of a table, but that shown in the sketch is free from this fault. Twist a single piece of wire, as shown, and bend it in such a way that, when the ink bottle is gripped as indicated, the two pointed ends will exert a slight pressure on the lower surface of the table top, so as to prevent the bottle from slipping.—Violet Johnson, Rockford, Ill.




### Lugs Convert Old Brake Wheel into a Chain Wheel

When the chain wheel on a hand-operated crane, used in a foundry, broke, an old freight-car brake wheel was made use of to take its place. A number of lugs of heavy strap iron were bolted around the edge of the brake wheel in such a way that the chain could not slip off them. The wheel did good service until the proper repair part could be obtained.—M. E. Duggan, Kenosha, Wis.

### How to Test a Used Car

Besides the general advisability of purchasing a used car from some person in whom the buyer has reason to place confidence, a few simple tests will be of assistance, although too much reliance upon them is not recommended.

No part of a car is more important than the steering gear. Certain small cars

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have steering systems which are likely to make trouble if badly worn; this is difficult to detect on a smooth road, but will likely show up if the car is driven over a rough road at about six miles an hour. This kind of a test will also cause various rattles and squeaks, made by loose parts, to become noticeable. A bad clutch, or a worn transmission, can be manipulated by the demonstrator so that a passenger will not notice any trouble; it is therefore advisable for the purchaser to drive the car himself, and note the action of the clutch and gear shift. The brakes should be given good tests, both by stopping the car from a fairly high speed, and by braking down a hill.

Also, if possible, open the drain plugs of the transmission, and rear axles, and see if any oil or thinned grease runs out. Often a bad set of gears, or gears with broken teeth, can be made noiseless for a short run by packing the case with heavy grease.

One of the easiest things to ruin on some cars is the storage battery. See that it turns the engine briskly, and that the generator charges it at a proper rate when driving at a moderate speed.

During a driving demonstration, one should listen carefully for loud knocks in the engine and other parts. Worn bearings can be tightened to conceal somewhat the noise they would otherwise make, and certain loose parts can, by such methods, be made to run quiet for a time.

Above all, avoid an "oil pumper"; that is, an engine whose pistons and rings are worn so that it pumps oil into the combustion chambers, causing most of the misfiring and bad running generally. Such an engine will run smoothly for a while, but after a long drive, if misfiring has occurred, the valves should be examined for oil leakage, which is a strong indication that the pistons and rings are worn.

Some of these things a novice can do; for others he must take an experienced friend with him to the demonstration. But the most expert mechanic, unless he has actually seen and felt the entire mechanism of a car, cannot be sure that all parts of it are in good condition, and this fact makes it advisable to be very careful from whom the car is bought.—Adapted from National Harness Review.

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¶ A useful coat hanger can be made from a newspaper rolled up and suspended by a cord around its center.

### Steering Wheel Partly Cut Away to Improve Driver's Vision

On many low-slung roadsters the top of the steering wheel is on a level with the driver's face, and often comes directly

A Portion of the Rim of a Steering Wheel is Removed, to Give the Driver an Uninterrupted View Ahead

in his line of vision. To remedy this condition, a quarter of the wheel rim can be removed, thereby permitting an unobstructed view of the road; and, though the appearance of the wheel suffers a little, its strength is not impaired.

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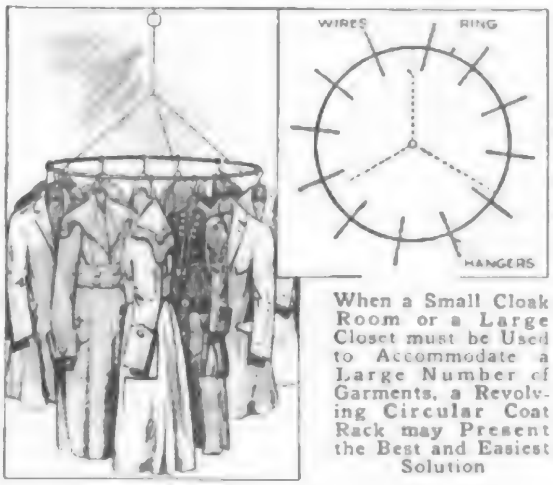
### Rotating Clothes-Hanger Rack

In a household where parties were frequent, the coat room was generally found to be too small to hold the garments of all the guests. An auxiliary coat rack was therefore made out of a ring of heavy steel wire, and clothes were suspended from it by ordinary hangers. Anyone who used it could find his clothes by




When a Small Cloak Room or a Large Closet must be Used to Accommodate a Large Number of Garments, a Revolving Circular Coat Rack may Present the Best and Easiest Solution

turning the ring, and as the pegs along the walls were used as well, the capacity of the room was doubled.

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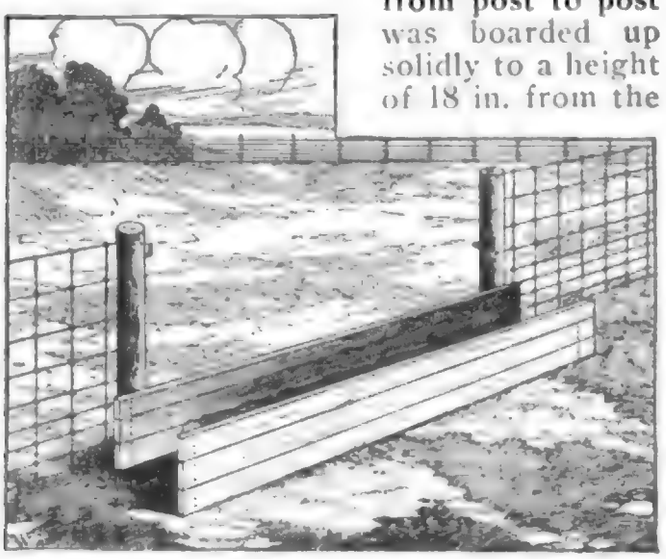
### Hog-Proof Gate Allows Free Passage to Horses

A farmer uses this arrangement to keep the hogs in one lot, while allowing his cattle and horses to pass unrestrained into another pasture. The gate was removed from the hinges, and the space from post to post was boarded up solidly to a height of 18 in. from the ground. About 18 in. from each gatepost, inside the lot where the hogs were confined, a short post was driven. Long boards nailed from one to the other of these posts made another panel of board fence, 18 in. high and parallel with the boarded-up gate, with an 18-in. space between the two low walls. When a hog comes to this detached panel, it will go to the end and pass round into the narrow passage between the two board walls, continuing on through and out at the other end till it tires of the performance. One that is short enough to turn in the 18-in. passage is too small to jump or climb over the boards before it, and one that cannot turn is unable to face the wall and make the attempt to climb.



**Two Low Fences across the Gateway will Stop the Hogs, but Allow Horses and Cattle to Pass**

All other stock, except small calves or colts, will step over the low walls. No wide cracks, offering footholds, should be left between the boards.—H. F. Grinstead, Columbia, Mo.

### Pads on Chair Legs Protect Floor

A simple method of preventing the legs of chairs, or tables, from scratching finished floors is to screw a small rubber disk at the bottom of each leg. To keep the head of the screw from touching the floor, make a depression in the wood with a brace and bit, at the spot where the screw is to enter. Then place the disk in position, and drive the screw as far as it will go. The center of the disk will be drawn a short distance into the counterbore by the screw head, but the outer part will form an effective pad.—James E. Noble, Portsmouth, Ontario.

### Testing Metal Float for Leaks

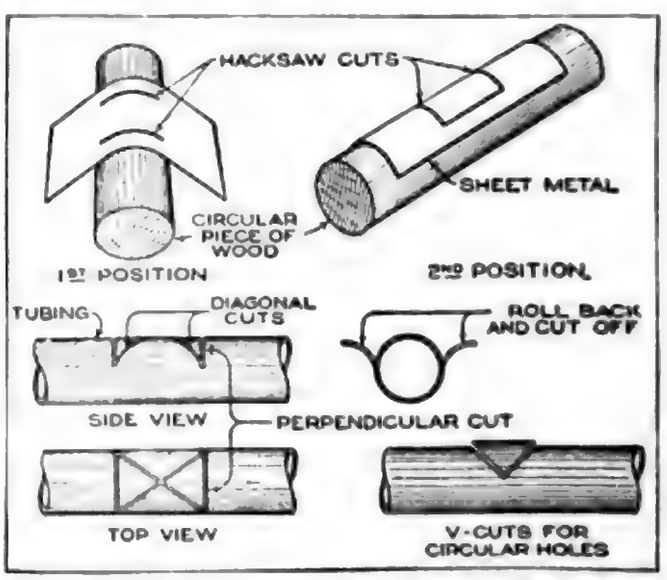
A leak in a metal float of a carburetor may not be visible to the eye, although indications of its presence are quite evident. To test the float, heat a vessel of water till it nearly boils, and immerse the float. The heated air inside it will expand, some of the air will be forced through any leak that may be present, and bubbles will form at this point, showing the position of the leak.—Howard D. Wildman, Schenectady, N. Y.

### Spade Prevented from Cutting Shoe

Those who do a good deal of digging with a spade find eventually that the sharp upper edge of the blade causes considerable wear on the shoe which is used in pressing it into the soil. To prevent this, make a flat surface along the edge on which the foot is usually placed, by first making a vertical slit in the metal, near the handle, and then bending ½ in. of the upper part of the blade to right angles.—J. Nolan, Oakley, Calif.

### Cutting Square Holes with a Hacksaw

When it is necessary to cut a hole in sheet metal or tubing, as for the installation of a muffler cut-out or exhaust heater, a very clean job can be done with a hack-




**With a Little Ingenuity a Hacksaw may be Made to Cut Rectangular and Circular Holes in Sheet Metal and Tubing**

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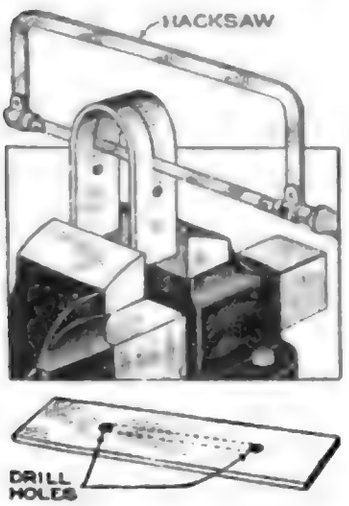
saw, if it is used with a little judgment. When a rectangular hole is to be cut in sheet metal, place the piece over a cylindrical piece of wood, and saw two parallel slots where two of the opposite edges of the hole are to be located, holding the saw across the wooden cylinder. Then, without changing the position of the saw, turn the metal so that slots may be cut in the same way along the two remaining edges, and the result will be a clean rectangular hole. When the same kind of a hole is needed in a piece of tubing, make two parallel cuts, and also two diagonal cuts, as shown in the sketch. The adhering pieces are then rolled back and cut off, leaving a clean hole. When an approximately circular hole is needed in a tube, make V-shaped cuts, as shown; but before starting to cut, be careful to locate the points of the "V's" so that the lengthwise and cross diameters will be approximately of the same length.



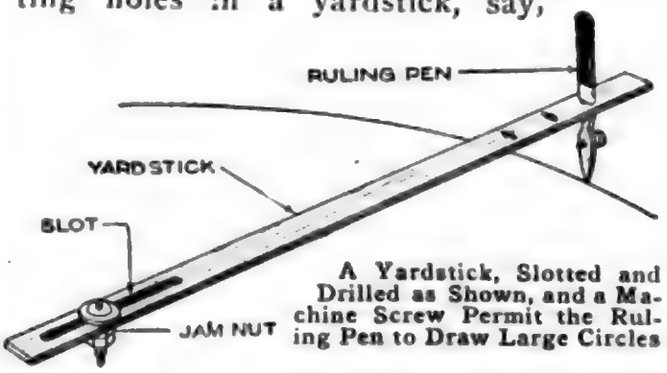

The second illustration shows how this method was applied to a thicker piece of steel. It was one of several in which thin slots were needed, and in this case the locations were first marked with a scriber, and holes drilled at the ends. Each piece was then heated and bent around a piece of pipe into a U-shape, after which it was placed in a vise and slotted in the manner described, the ends of the slot having been already cut by the drill. It was then heated again and straightened, and the edges of the slot were trimmed with a file.

### Chips in Slots of Boring Mill

Chips of metal must always be cleared from the slots of a boring mill whenever work is to be done on metal of a different kind. To save a good deal of the time that is lost in this way, place small pieces of wood in all the slots that are not often used, making a fairly tight fit. When one of the plugged slots is needed, it only takes a moment to pull out the small stick, and those which remain plugged are kept clear of metal.—S. G. H., Pittston, Pa.

### Compass for Large Circles

A compass for drawing large circles with a ruling pen is readily made by cutting holes in a yardstick, say,

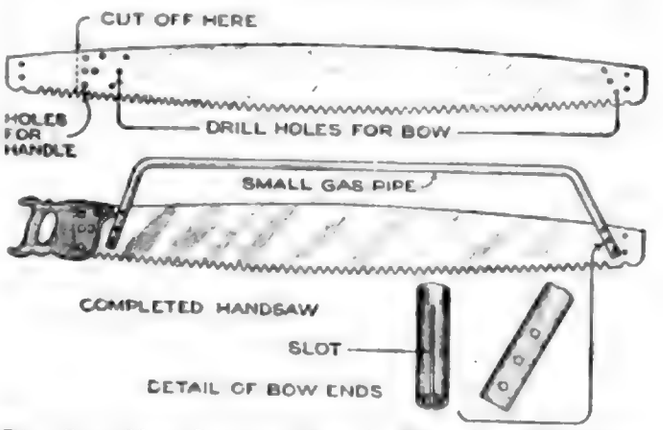



A Yardstick, Slotted and Drilled as Shown, and a Machine Screw Permit the Ruling Pen to Draw Large Circles

3 in. apart, and a long slot at the other end, 3 in. long. In this slot is placed a machine screw provided with a nut and another against it as a jam nut. The end of the machine screw is sharpened to a point forming the center for the compass.

### Brace for Crosscut Saw

The principal objection to the use of a long crosscut saw by one man only is that the far end of the saw has a tendency to wabble from side to side, and the middle of the saw tends to buckle on the push stroke. To avoid this trouble, clip off 4 in. from the end of a common crosscut saw, about 5 ft. long, and drill holes through the end for a bow made of iron pipe or tubing, to extend nearly the whole length of the saw, as illustrated. In the end from which the tip was cut off, drill holes for mounting an ordinary one-man handle. While the saw will be made somewhat heavier by the metal bow, the added weight will




The One-Man Crosscut Saw is Kept from Wabbling and Buckling by Attaching a Metal Bow Which Stiffens It

cause no inconvenience except in carrying the saw, and may even be of assistance in actual use. If the timber to be sawed is quite heavy, the bow will have

to run farther up from the saw, and it should also be made of correspondingly heavier pipe.—S. R. Winters, Washington, D. C.

### Windlass Raises Motorcycle in Air for Cleaning

Most motorcyclists who clean and repair their own machines know how irksome the work becomes when it is necessary to sit, or stoop, to get at the motor and other parts. This is made unnecessary by using this homemade tackle device. With it the machine is hoisted to a convenient position and lowered again with very little effort. With the motorcycle about 4 ft. above the ground it is possible to clean it or repair it while standing in an upright position, and without cramping or straining the muscles by bending and stooping. About all that is necessary is a length of heavy window cord, two screw eyes, and two pulleys. The windlass crank was, in this case, made from an old ice-cream freezer handle, and was installed with a few simple fixtures, turned out by an amateur mechanic in his home.

### Rat-Poison Box Protects Poultry

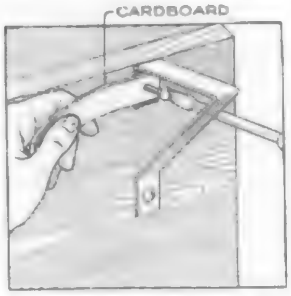
When poison is used to rid a poultry farm of rats, great care must be exercised to prevent the stock from gaining access to it; and a reliable method of doing so is found in the "poison box," of which a practical type is shown in the sketch. It is 18 in. square and 12 in. high, and is provided with a hinged lid, which should be kept locked at all times. The holes which admit the rats are 1½ in. in size, and should on no account be made any larger, as the safety of the chickens depends on their inability to enter the box. Very small chicks must be prevented from getting near it, and this can be managed by keeping them in some kind of inclosure. Sugar of lead is a dependable poison to use, two parts of corn meal being mixed with one part of the poison.—J. T. Bartlett, Boulder, Colo.

### Desk Blotter Used as Desk

A traveling salesman found that many of the rooms which he occupied in different hotels were not provided with tables suitable for writing, and he therefore included a movable one with his baggage. It consisted of a large blotter with a rigid back, and a small cast-iron clamp, with which he was able to secure it firmly to the arm of a chair. He generally found an armchair in the hotel rooms he engaged, and the blotter fitted into a large suitcase, taking up hardly any room.—George O. Reed, Detroit, Mich.

### Cardboard Holds Screws for Starting

The sketch shows a bracket being screwed to woodwork under difficulties. It is only one of many awkward situations where a screwdriver must be used. Each of these problems calls for ingenuity on the part of the workman, but a number of them can be solved by passing the screw through the end of a strip of cardboard. The cardboard holds the screw in places where the fingers cannot enter, and keeps it steady until it has been fairly started.—Chas. H. Willey, Concord, N. H.




### Picking Up Papers and Leaves

For picking up fallen leaves or old papers from a lawn, a stick fitted with a sharp metal wire or nail on the end is commonly used, and the leaves are then removed from the stick and thrust into a basket or other receptacle. It has been found that an improvement on the smooth point is a three-cornered file, which is rough enough so that the leaves do not fall off, once they are pierced, until pulled off by the hand.—Chas. A. Goddard, Los Angeles, Calif.

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# A Ring-and-Tangle Puzzle

By EVERETT A. THOMAS

ANYONE who enjoys perplexing his family and friends can get a good deal of entertainment out of a puzzle made with three rings, about 1¼ in. in diameter, a straight piece of wood, 12 in. in length, and about 6 ft. of heavy string. He must be prepared to do a little close thinking himself before passing the mystification on to others, and he should not expect to understand the puzzle merely by studying the illustrations. He will have no difficulty in making it, as the rings can be obtained from a blacksmith or a hardware dealer. Harness rings will do, and the wood can be cut from a yardstick. The stick must be of a size to slide easily through the rings, allowing about ⅛-in. clearance.

When the materials have been obtained, divide the stick into three equal parts, as shown in Fig. 1, and paint them red, white, and blue respectively, beginning at the left. Bore holes, ¼ in. in size or a little larger, at the points of division, and also bore small holes at the ends, just large enough to admit the string. Paint each of the rings to correspond with one of the three divisions, so that there will be a red, a white, and a blue ring. Then attach the string to the stick as shown in Fig. 2, tying knots at both ends to secure it at the small holes, and fastening it at the large holes with the type of hitch shown in the drawing. Each ring will then hang in a large loop beneath the division painted the corresponding color on the stick.

Everything is now ready. The object is to get all three rings onto any one of the large loops at the same time, or to exchange their positions, so that the red ring hangs beneath the blue division, and vice versa. Lay the puzzle on a table, so as to leave both hands free, and pull down the loop of the hitch; then pass the red ring through the loop, as shown in Fig. 3. To bring the loop to the shape shown in Fig. 4, take hold of both parts of the string, as close to the hole as possible, and pull vigorously, until the small

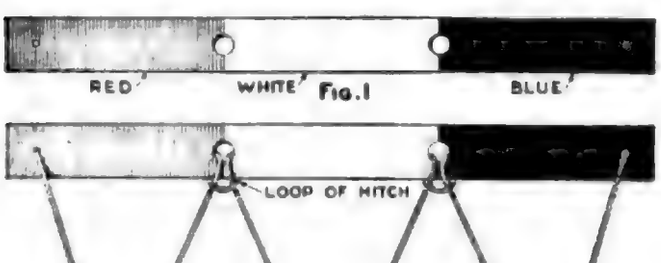

Fig. 1

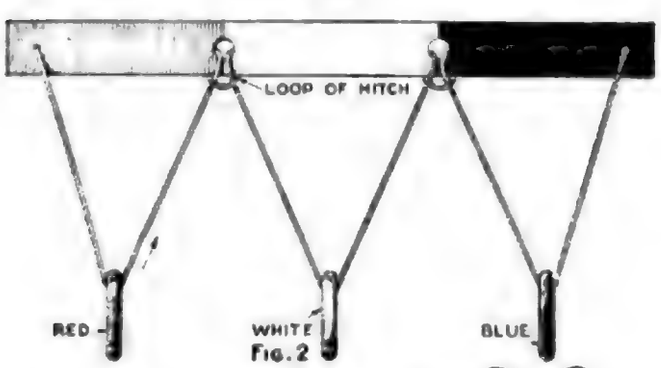

Fig. 2

Fig. 3

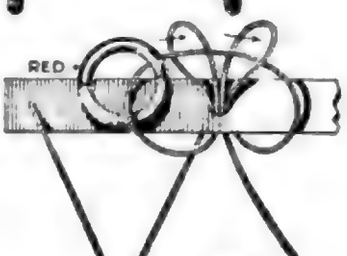

Fig. 4

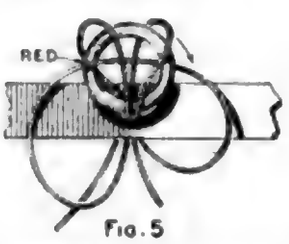

Fig. 5

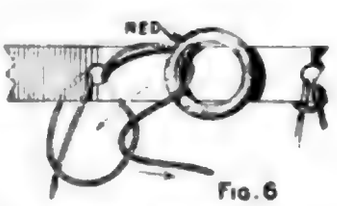

Fig. 6

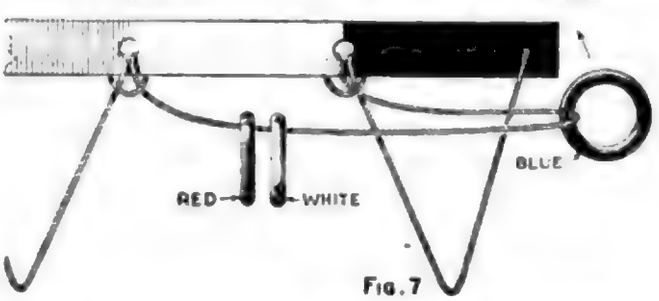

Fig. 7

Fig. 8

**Three Harness Rings, a Portion of a Yardstick, and a Piece of String Make a Diverting Puzzle with Which the Amateur Magician can Bewilder His Friends. An Apparently Impossible Task Turns Out to Be One of Extreme Simplicity**

loop comes right through the hole. It will have a tangled appearance, but if the string has been pulled a sufficient distance, the condition shown in the drawing will be realized. The next step, shown in Fig. 5, is fairly simple, being merely the condition shown in Fig. 4, with the ring passing through the loops on its way to its new position. After it has passed through, take hold of the strings at the back of the stick, as near as possible to the hole, and pull the small loop back through the hole, reversing the process which produced the arrangement of Fig. 4. The result will be as shown in Fig. 6, and nothing more is necessary, except to reverse the process of Fig. 3; or, in other words, to pass the ring through the small loop downward and to the right, so that it will occupy a position beside the white ring on the large loop in the center.

Before going any further, the process just described should be repeated a few times in both directions and with all three rings, so as to develop familiarity with the operation. When this has been done, the next step is to exchange the positions of the rings; for practicing this the blue ring may as well be used.

First, get all three rings onto the central loop by the process just described, and raise the blue ring to the level of the stick on the right, as shown in Fig. 7. Pass it over the end of the stick, as indicated by the arrow, and push it along the stick toward the left. It will gather up the right-hand loop into a tangle as it travels, but will eventually leave it behind when it reaches the center of the stick, and the result will be as shown in Fig. 8. Continue passing it along to the left, until it has gone the entire length of the stick, gathering up the left-hand loop on its journey. When it has reached the end of the stick, let it drop, and it will fall into position beside the red ring on the central loop, from which it can be easily moved into the loop on the left by repeating the operation described at the beginning.

## Photographing "Moonlight on the Water"

"Moonlight on the water" scenes cannot be photographed if the "camera never lies" saying is true, since dark landscape

A Landscape, Photographed by Daylight under Special Conditions, can be Made to Resemble a Moonlit Scene, Though Care is Needed in Development

scenes require long time exposures, which are not practical with rippling waves. In the case of good moonlight scenes, the camera does lie, since the "moon," in reality, is the sun. Practically all moonlight scenes are taken in daylight. The conditions under which they can be taken, so as to suggest the night with its more dark tones, are few, and depend on the exposure being so timed as to record the high lights and half tones only. This is almost impossible when a very bright sun is shining. For pictorial effects, as well as for the proper accomplishment of the exposure, clouds must partly hide the sun's disk, or the sun will blur the negative. The hour after sunrise, or that preceding sunset, when but the edges of the horizon are illuminated, is an ideal time for such scenes. The water reflection takes care of itself, although the more placid the ripples and waves, the better the chances for success. One-hundredth of a second speed, at stop 16 (U. S.), is the ideal exposure. On fixed-focus cameras, the smallest stop, at snapshot speed, is successful. In developing, care must be taken that all the lights and shades are fully developed. From 20 to 30 minutes should be allowed for developing, using a very weak solution.

## Mitten for Lifting Hot Dishes

For carrying hot dishes, a specially made mitten is much preferred by some to the ordinary square holder, as it gives more perfect security from burns caused by the holder slipping. The back of the mitten should be of drilling or other strong cloth. The face is best made of about three thicknesses of some heavy cloth, the middle one of which may be made ¼ in. scant all around, to avoid too thick an edge for sewing. The pattern for the mitten may be made by laying the hand on a piece of white paper and tracing around its outline, being careful to allow sufficient material beyond this so that the mitten will not be too tight a fit.—C. A. Pease, Monrovia, Calif.

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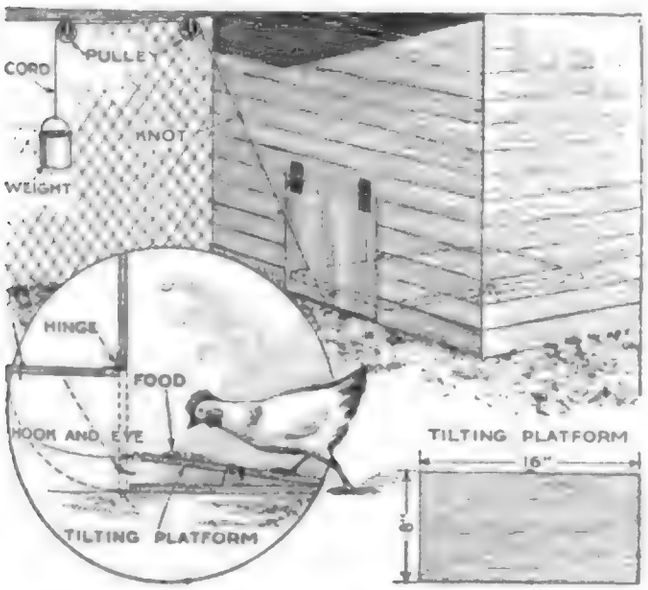
## Hens Open Door of Poultry House

The following is one of the simplest methods of enabling hens to open the henhouse door in the morning, thereby relieving their owner of the necessity of rising at daybreak to let them out. The door of the henhouse is hinged at the top, so that it opens outward, and the lower edge catches against the floor, so that it cannot swing inward. Near the lower edge on the outside a cord is attached, which passes upward over two small pulleys hanging from a beam. The other end of the cord supports a tin can weighted with stones, so as to be just heavy enough to pull the door open and keep it so. On the floor of the henhouse, right in front of the door, is a tilting platform, with a hook in the front edge, which fits an eye screwed into the door. The door can therefore be locked at night by catching the hook in the eye, and the pull of the cord against the door on the outside has the effect of making the hook hold securely. When the owner has locked the door in the evening, after the hens have gone to roost, he sprinkles a few grains of feed on the outward end of the tilting platform, which is now in a horizontal position, and leaves the henhouse by the large door, which he locks behind him. On the following morning, the first hen which jumps upon the platform to pick at the feed tilts the platform, releasing the hook from the eye; and the weighted can on the outside pulls the

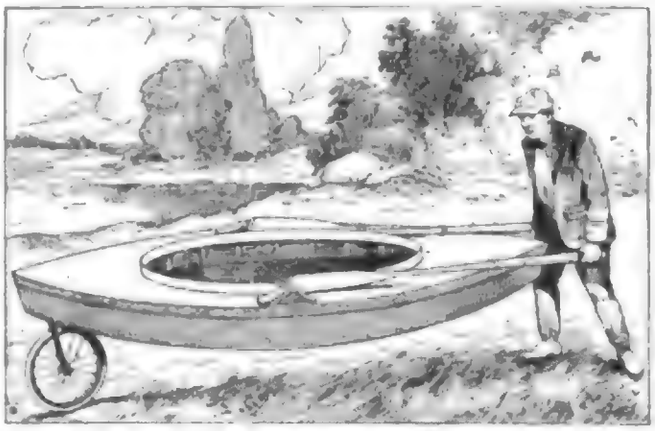



**The Hens Unlock the Poultry-House Door at Dawn, by Stepping upon a Tilting Platform**

door open. A knot in the cord, made to catch in the pulley, will prevent wrenching at the hinges.—L. Hussakof, Brooklyn, N. Y.

## Wheeling a Boat to Water

The sketch shows my way of taking a hunting boat to the river. At the front end of the boat is a tube extending through from top to bottom. Into this



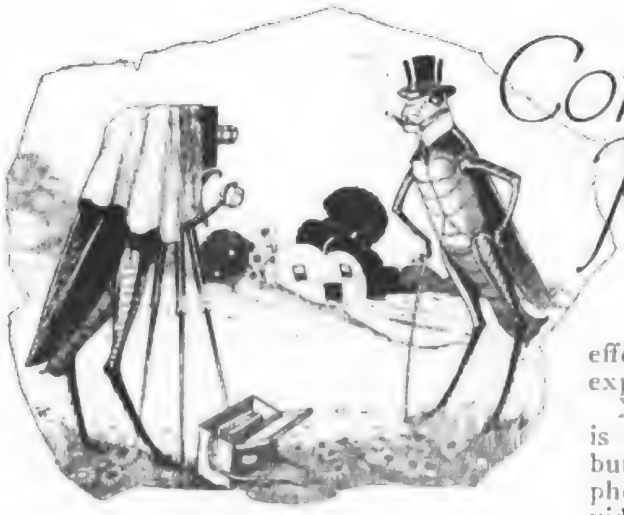
**For Moving the Boat to the Water, It is Transformed into a Wheelbarrow with the Oars for Handles**

tube I insert the front fork of a bicycle, the top of which is bushed to fit snugly in the tube. At the rear end of the boat I have a hook on either side, as shown. The oars are placed under these hooks, with the blades resting inside of the oar locks.

Thus the boat is transformed into a wheelbarrow, and is easily wheeled to and from the water. Upon arriving at the water, the bicycle wheel with the fork attached is taken out of the tube and put in the boat, and the journey continued by water.—Guy E. Waite, Ottawa, Illinois.

## Removing Rag from Rifle Barrel

A cleaning rag wedged in a rifle barrel sometimes presents a problem on a hunting trip, if no gunsmith is within reach. However, if a length of iron rod, or a stove poker, can be obtained, the difficulty can be met. Bring it to a red heat, flatten it a little at one end, and give it two or three twists with a pair of pliers, so as to make it resemble the shank of a drill. Finish it off to a drill point, and sharpen it with a file. Then temper the point slightly in cold water, and bend the other end over, so as to make it easy to turn. It is used in the same way as a corkscrew. Thrust it into the gun barrel, and twist it into the jammed piece of rag until it has taken a firm hold, after which it is pulled out with the rag attached. A heavy wire has been successfully used in the same way to remove obstructions from a .22-caliber barrel.—Herbert J. Key, Spirit River Station, Alberta, Can.



# Comic Insect Photography

By Lehman Wendell

ONE of the most amusing of all photographic diversions is the making of comic insect pictures. There is nothing either mysterious or difficult about this branch of photography, and anyone with a little patience and perseverance can produce pictures quite as interesting as mine. One of the essentials, however, is a suitable camera. Any camera that is provided with a good lens and a long bellows extension will serve the purpose. A good lens is essential because the interest of the pictures lies largely in their details, and one cannot produce fine details with a cheap lens. The bellows must be sufficiently long for close-up work, because the pictures are all staged a foot or two from the camera, necessitating an unusually long draw of the bellows.

The pictures are all arranged and photographed indoors. It would be out of the question to take such pictures out in the open, where the gentlest wind would be sufficient to upset the whole scheme of arrangement.

The insects themselves are captured alive, then put to sleep with chloroform. The simplest method of administering the drug is as follows: Moisten a pellet of cotton with the drug and place it in the bottom of a drinking glass. Watch the proceedings carefully, and the moment the insect is fully asleep, which will require about five minutes, take it out, pose it and make the exposure. It is well to have everything else in readiness. Have the picture arranged, and the camera in place and focused before the insect is posed. Then no time will be wasted, and the picture can easily be taken before the insect wakes up. It is well to watch the antennæ of the insect carefully while the exposure is being made. If they move ever so little, it is an indication that the insect is not fully chloroformed, and it should be subjected a little longer to the effects of the drug, after which a second exposure should be made.

Naturally, one of the main difficulties is to get the insects to stand upright; but a little ingenuity on the part of the photographer will soon solve each individual problem. In many cases all that is necessary is to balance the insect against some object, though this must be done cleverly so as not to give the impression that the insect is leaning against something for the sake of support. In other cases, a fine wire prop will be required, and this should always be skillfully hidden behind the insect so that it will not be apparent in the finished picture. I prefer a fine copper wire, as this is soft and pliable, and is easily bent to shape.

In most of my pictures the foreground consists of some species of moss. This can be found growing in abundance in almost any wooded locality, and it is well to choose a number of different varieties to avoid sameness in one's pictures. Where bushes are needed to break the monotony of the landscape, I use a certain species of lichen, which grows luxuriantly in many parts of the United States. In fact, there are innumerable vegetable forms which can be combined with insects to produce interesting and weird effects.

I almost invariably use a white background, as this seems to set off the insects to best advantage. A sheet of white paper placed several feet from the main setting, will serve the purpose admirably. By placing it at a distance from the main objects it is thrown out of focus, thereby preventing the grain of the paper from showing. For a black background I use a sheet of black paper, or any dark object, such as a black garment, placed far enough away to be out of focus.

Occasionally clouds will be found to enhance the picture greatly. For this I employ a set of 12 by 14-in. enlargements made from cloud negatives, and I use one of these prints much as a photographer uses a background in his studio. It is placed immediately behind the moss.



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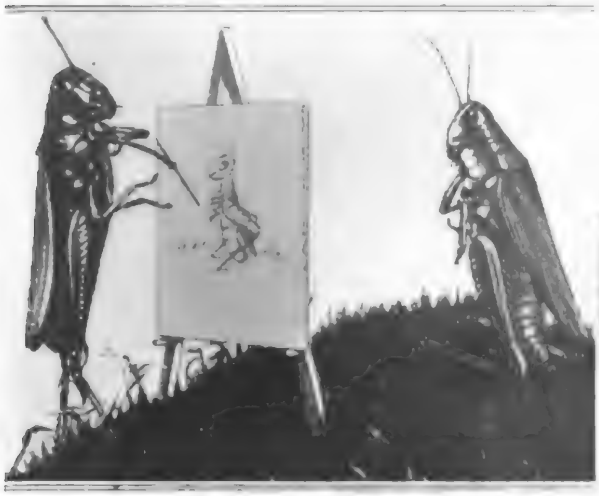
"A HOPPER BUNGALOW"

A Foreground of Moss and Two "Sunflowers" Lend a Distinct Air of Realism to the Apple Dwelling House of the Two Grasshoppers

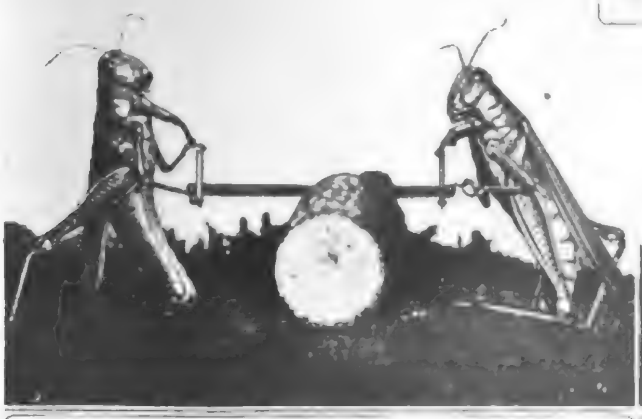


"BEWARE OF VANITY"

It Is Apparent from This Photograph That Considerable Expression can, by Skillful Posing, be Put into the Attitude of the Insects

"THE FISHERMAN"

The Lake Is Nothing More Than a Pan Full of Water, and the Fishpole Is a Slender Stalk of Hay, Carefully Bent to a Curved Shape



"THE LUMBERJACKS"

Besides the Usual Moss Foreground and Bits of Fine Wire, the Materials Used Here Include a Dentist's Saw and Some Bits of Broom Straw

"THE GARDENER"

A Few Twigs Form the Body of the Wheelbarrow; the Wheel Is a Round Disk Cut Out of Stiff Pasteboard



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because it must be in sharp focus. Of course, such an enlargement must be made on smooth paper so that the grain will not show in the finished picture.

In doing close-up work with a camera, it will be found that all planes of the picture are not equally sharp on the ground glass. If the portion of the composition nearest the camera is brought into sharp focus, objects 3 or 4 in. farther back will be blurred. This is due to the nature of a photographic lens when it is wide open. To overcome this, focus on the objects in the center of the composition, then use the smallest diaphragm opening of the lens. This will usually give a clear-cut picture throughout. A small opening, of course, means a much longer exposure, but I have found that with a plate or film of the ordinary speed, an exposure of 30 seconds will be found sufficient, providing the picture is staged two or three feet from a window.

In order to make my methods perfectly clear, let me explain briefly how some of my pictures were staged.

The Fisherman: This picture was posed in a small pan of water. The pan was filled almost to overflowing, and this prevented the edge of the pan from showing. The moss rests on a wire support placed in the bottom of the pan. The background is a 12 by 14-in. enlargement from a cloud negative, and the trees are a part of this enlargement. The fishpole is a slender stalk of hay, while the line is a fine embroidery thread.

The Lumberjacks: The foreground is a piece of moss, and the log is a section of a small branch. The saw is one used by dentists, and the handles are tiny bits of broom straw, split and tied on with fine copper wire.

A Hopper Bungalow: The foreground is moss, as usual. The house is an apple hollowed out, the window frames being straw, and the porch the half of an acorn cup. The big sunflowers are minute flowers taken from a common weed.

These few examples will serve to illustrate my methods, and the ambitious amateur can easily duplicate them.

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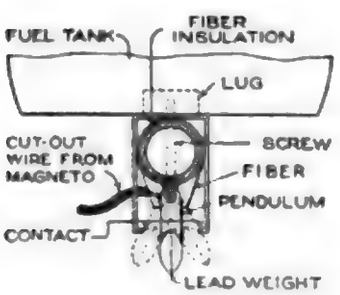
### Gravity Switch Stops Motorcycle Engine in Case of "Spill"

Even though a motorcyclist may escape injury in the occasional spills that the best of them take, the machine becomes as dangerous as a kicking horse, once it is down, with the motor continuing to run. To guard against possible injury and damage to the machine itself, a motorcycle was equipped with a simple gravity switch, which automatically stops the motor in the event of the machine being overturned.




As illustrated by the accompanying sketch, the switch is inconspicuous, and attaches to the machine on the lower horizontal frame bar just in front of the motor. A U-shaped copper piece is fastened astride the frame bar as indicated, being thus "grounded" on the frame of the machine. Fastened to the lower side of the same bar, but insulated from it, hangs a 4-oz. lead pendulum. This pendulum is connected with the cut-out wire from the magneto.

Obviously, when traveling on the road, the little pendulum hangs downward, but the instant the motorcycle falls over, the switch begins to function. The pendulum swings to the right or left, as the direction of the fall happens to be, and its copper stem comes in contact with the points of the copper electrode. This grounds the magneto, and the engine cannot fire until the machine is again restored to its upright position.—John E. Hogg, Los Angeles, Calif.

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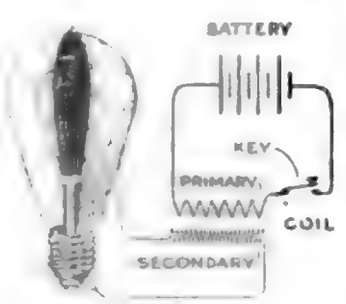
### Induction Coil Produces Sparks in Lamp Globe

Obtain a blown-out incandescent lamp and stretch some bare wire around the globe, or better, cover half of it with tin foil, and connect by means of a wire to one of the high-tension terminals of a spark coil. Connect the other high-tension terminal to both inner and outer contacts of the lamp base, as shown, and wire up a battery to the primary of the coil. A peculiar light will be seen inside the lamp globe, which is of somewhat similar nature to the phenomena occurring in the Geissler tubes used in laboratories.

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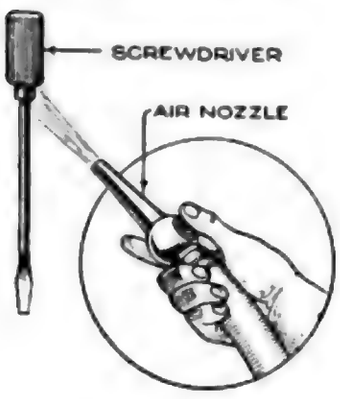
### Sewing Machine Made into Jig Saw

A sewing machine, which had become useless in its original function, was equipped with a saw blade and turned into a jig saw, with very little change in its mechanism. Part of the shaft engaging the needle was cut off with a hack-saw a short distance from the base; a short vertical slit was made at the lower end to admit the blade, and a hole was bored through it, so that the blade could be held in position with a small screw. The blade was then run down through the top of the stand and fastened to a stiff coil spring, which was attached to the framework underneath. This served to pull the saw downward in the return half of each stroke, and the machine was used with great success in intricate wood carving. The stroke was so short that only half of the blade was used, but after a time it was reversed, and the other end put into operation.—Dale R. Van Horn, North Loup, Neb.

### A Screwdriver-Compressed-Air Trick

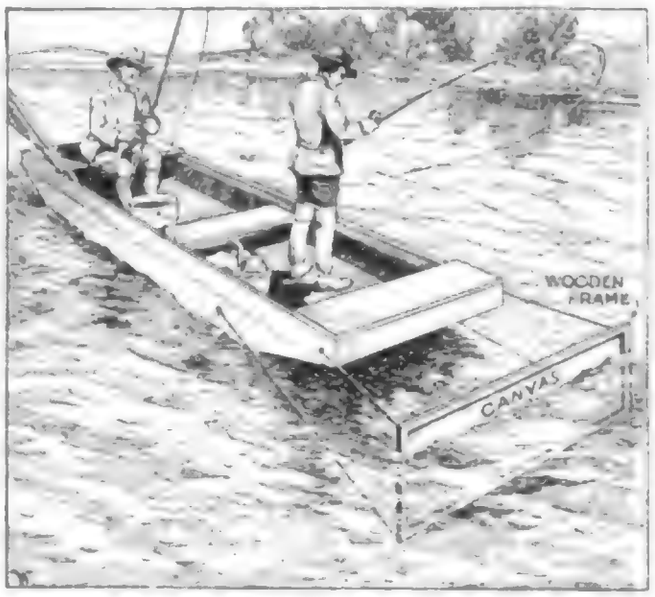
Ordinarily a screwdriver will fall to the floor when dropped from the hand. The same object, when struck by a current of compressed air while falling, will usually be blown to one side, but not always. If the stream of air is directed upward at an angle of 45°, the screwdriver will remain stationary in the air without any visible support. It should be placed so that the lower part of the handle is just in the edge of the air stream, and from 3 to 6 in. from the nozzle, depending on the air pressure and the weight of the screwdriver. This sounds unbelievable, but may be proven by experiment, although the proper relations between air pressure and distance of the tool from the nozzle will probably not be found at the first trial. Since opinions may vary as to the explanation of the phenomenon, none is given here.




¶Lines drawn on tracings with red ink are hard to erase. If the ink is slightly diluted with water it still shows on the blueprint, and is easier erased.

### Current Propeller for Boats

The "water mule," or current propeller, by means of which the Mississippi clam fishers move their flat-bottomed boats

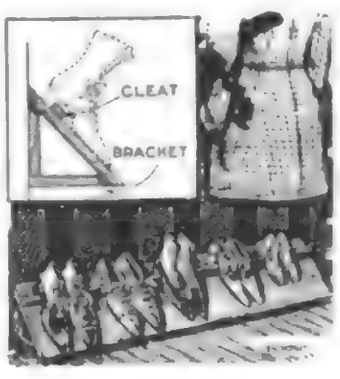



**A Boat Equipped with a "Water Mule" Depends on the River Current for Motive Power, and Moves Downstream at a Good Speed**

downstream while dragging the bottom with the clam rakes, is an appliance which may be turned to good account in any stream where there is a current. It consists of a wooden frame covered with canvas, as shown in the illustration. By means of four ropes it is fastened at one end of the boat in such a manner that it stands upright in the water. Thus it offers resistance to the current, and when once the boat is under way, the "mule" pulls it along as fast as the water moves.—Earle M. Pettit, Niagara Falls, N. Y.

### Space-Saving Shoe Rack

A form of shoe rack which takes up scarcely any floor space, and but very little wall space in a closet, consists of a board attached to the wall in a slanting position by brackets, or cleats. A cleat, about ⅜ in. high and 1 in. wide, is nailed the full length of the rack at a distance of 3½ in. from the wall. The shoes rest on the rack in the position shown, and are easy to see, but not likely to be accidentally knocked off the rack.

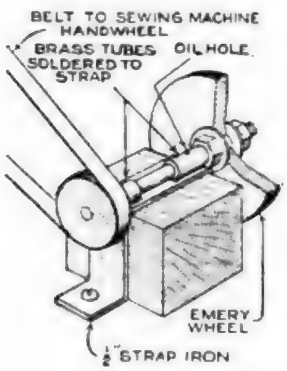


### Metal Cover for Tobacco Pipe

When smoking a pipe in a high wind, or in a fast-moving automobile, it is sometimes difficult to keep the pipe alight and to prevent hot ashes from blowing in the smoker's eyes. A pipe with a covered bowl is one of the remedies. The ordinary type of hinged cover is rather difficult to make without the proper tools, but it is generally possible to find a small piece of tin, and to cut a disk of the right size, making perforations with a nail. The disk should have a small lug, as shown in the sketch, which should fit around a short nail driven in the edge of the bowl, and should grip it snugly enough to serve as a lock. Another nail on the opposite side of the bowl serves as a hinge.—Wm. E. King, Monessen, Pa.

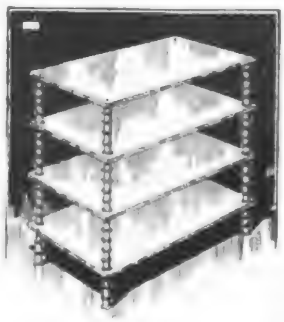
### Grinder Fitted to Sewing Machine

A small emery wheel, belted by means of a pulley to a sewing machine, is a convenient addition to the equipment of any household. A wheel 2½ in. in diameter will be large enough for most purposes. Make the shaft 5 in. in length and ¼ in. in diameter, and pass it through two pieces of ¼-in. brass tubing, ½ in. long. These will serve as bearings, and should be soldered to a piece of strap iron, which passes around a wooden block, as shown in the sketch; the block is secured by long screws to the table of the sewing-machine stand. Make the pulley of hard wood, about 1½ in. in diameter, and fasten it to the shaft with a flat-headed screw, which passes through the circumference of the wheel and enters a small cavity drilled in the shaft, thus serving as a set-screw. The screw hole in the wheel is, of course, countersunk. Make the belt of soft leather, about ½ in. wide, and when the wooden block is being screwed to the machine tables, line up the pulley with the handwheel, so that the two may be belted together. In this way, the ratio between the handwheel and pulley will insure high speed. In order to make the belt stay on the pulley, the latter should be slightly crowned.—Harold Jackson, Kankakee, Ill.



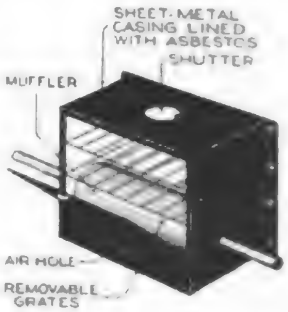

### Old Spools Used in Making Shelf Cabinet

A singularly decorative appearance can be given to a homemade table by stringing wooden spools on pieces of wire, and using them to form the table legs. Wire about 3/16 or ¼ in. in diameter is strong enough, and the shelves, or decks, are made of thin boards, with an equal number of spools at each corner to serve as spacers between each pair of boards. A coat of varnish is applied when the work is complete, and gives the spools an appearance resembling that of bamboo canes.—C. A. Black, Jr., Hightstown, N. J.



### A Muffler Stove on a Motorboat

The muffler as a fireless cooker contributes greatly to the convenience and pleasure of a trip by motorboat. The sketch shows the layout adopted by a boatman for a 30-ft. cruiser, the oven in this case being made of sheet iron and asbestos, and completely inclosing the muffler, which stands in the center of the cabin. The door is hinged at the bottom, and two wire gratings support the pans and cooking utensils, while a shutter at the top regulates the temperature, and the draft enters through a hole at the bottom. Potatoes, roasts, corn bread, and all oven-cooked foods are prepared on the gratings, and coffee is boiled by removing the lower grating and setting

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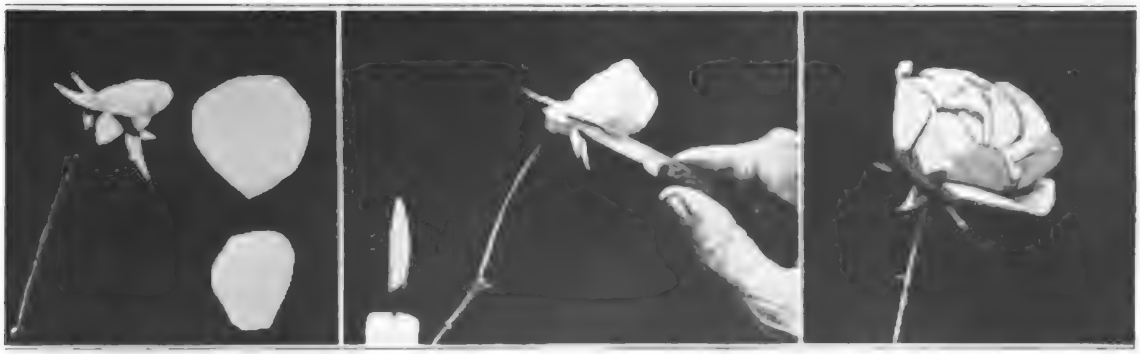
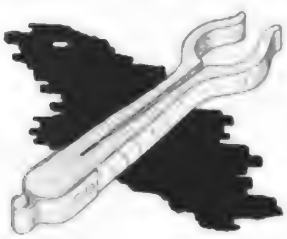


To the Left are Shown the Parts from Which the Rose Is Formed. A Touch from a Heated Knife Blade Fastens the Various Parts of the Flowers Together, Producing a Result Such as Shown at the Right

the pot directly on the muffler. Even in a gale there is nothing to prevent hot meals, as canned foods and soups can be heated in a very few minutes.—G. A. Luers, Washington, D. C.

### Holder for Hot-Water Bottle

Those who often have occasion to fill rubber hot-water bottles should use a holder to avoid the risk of being scalded. A pair of jaws at the end support the bottle by the neck, and a slot midway between them receives the projecting seam on the bottle, and gives flexibility. Cut a piece of ash or hickory, 8 in. long, 2 in. wide, and ¾ in. thick, and sketch the outline of the tool upon it with a pencil.



Locate a point on the center line, 1½ in. from the end which is to hold the bottle, and bore a hole 1½ in. in diameter. Then cut out the tool with a coping saw, and use a spokeshave and sandpaper to round off the edges. A reinforcing band, or strap, to pass around the end of the handle, is cut out of No. 20 gauge sheet copper (about 1/32 in.), and bent into shape, with a loop at the center to form an eye for the purpose of hanging the holder from a nail. Cut the central slot with a ripsaw, but do not bring it within half an inch from the first of the rivets which secure the strap. Then apply a coat of varnish.—C. S. Bartless, Albany, Georgia.

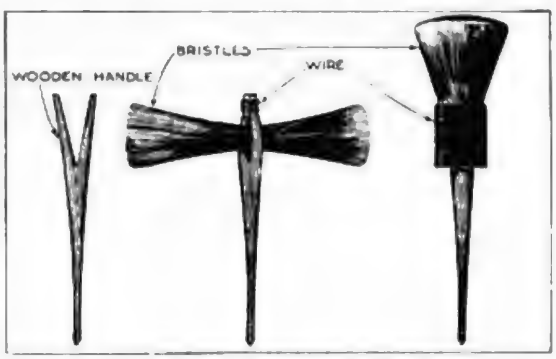
¶ When the handlebar grips of a bicycle break and come off, quite comfortable substitutes can be made by cutting off two pieces of old garden hose, about 6 in. long, and gluing them to the bar.

### Candle-Wax Flowers

From a fabric made by immersing a sheet of thin muslin, or some other material, in liquid candle wax, can be made a kind of artificial flowers, which when skillfully formed are difficult to distinguish from real ones. The wax may be colored any shade by boiling aniline dyes with it. The petals of the flowers are cut out of sheets of waxed muslin, and are fastened together by touching the edges with a warmed knife, which melts the wax so as to weld it together. In this way, very beautiful flowers can be built up in a short time, and a very close examination will be required to discern that they are not real.—S. Leonard Bastin, Bournemouth, Eng.

### Making Brushes from Hogs' Bristles

Small brushes of the type shown can be made at home, for pleasure or profit, and can be used for many purposes, from




But Little Skill Is Necessary in Making Small Brushes, and a Household can be Stocked Indefinitely at Very Slight Expense by Using the Method Illustrated Here

painting to shaving—if the bristles are exceptionally soft. Procure two or three pieces of wood, a few handfuls of hogs' bristles, a knife, some sandpaper, and a few feet of copper wire. The stick

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is first cut to the shape shown, with one end like a fork. The bristles are then placed between the prongs of the fork, and the ends of the prongs bound together. After this, the bristles are bunched together and bound with wire or waxed string, the ends being clipped to make them even.—H. C. Crocker, Edwardsville, Ind.

### Flower Box Built on Chimney

The flower box shown in the photograph is used in a California town to contain plants for winter and early-spring

**For Early-Season Blooming, Flowers are Given Artificial Warmth by being Planted in a Box Cemented to a Chimney**

blooming. It is cemented to a chimney outside a residence, and the masonry retains sufficient heat throughout the night to make the flowers thrive. On days that are cold enough to make a fire necessary indoors, it is, naturally, important to provide additional heat for the plants, and in this way they obtain it. Even in seasons when fires are not needed, the box makes a very decorative flower display.

### Cleaning Tracing Cloth with Carbon Tetrachloride

Pencil marks, dirt, grease, candle drippings, paraffin, and like substances may be readily cleaned from drawings on tracing cloth by means of carbon tetrachloride, a colorless liquid resembling water in appearance. It may be applied by means of a soft rag or a clean piece of waste, and rubbed until the marks disappear. It will not injure the cloth, and has the advantage over gasoline, which will answer the same purpose, that it is noninflammable; because of this feature, it may be kept in an office building without objection on the part of the fire inspector.

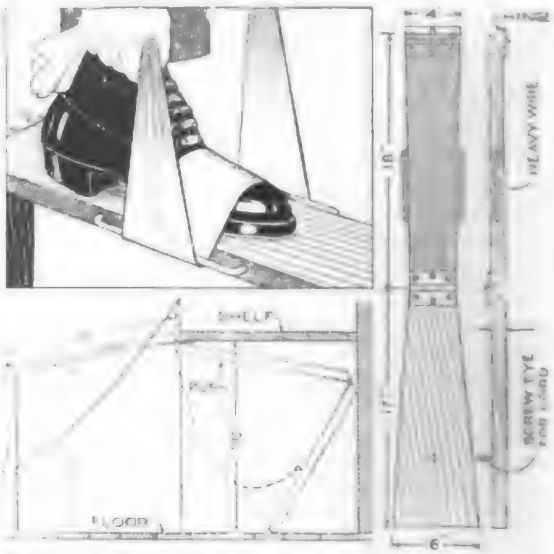
### Iron Pipe for Hulling Walnuts

Many black walnuts go to waste each year simply because of the disagreeable task of separating the nut from the green hull which surrounds it. I have found the following method clean and quick: A piece of pipe, about 2 ft. long and 1¼ or 1½ in. in diameter, is all that is necessary. The walnuts should be spread on the ground, or, better still, on a large board. The end of the pipe is pressed over each one in turn, and cuts off the green hull with the exception of a small piece at each end. The walnuts are allowed to dry one day, and the remaining pieces at each end can be readily removed without staining the fingers. As an added precaution, gloves may be worn, though it is hardly necessary.—George E. Perkins, Millburn, N. J.

### Support for Polishing Shoes

In households not provided with a regular stand for shoe polishing, it is sometimes difficult to find a suitable place for shining the shoes. Even where a special stand is provided, it may be troublesome from being in the way, and the collapsible stand illustrated may therefore appeal even to those possessing ordinary stands.

The support can be easily made, and attached under a shelf which may be used for any ordinary purpose. When not in




**A Shoe-Polishing Stand can be Made to Fold Up underneath a Shelf When Not in Use, and Still Be Ready for Instant Service**

use, the shoe-polishing stand remains folded up under the shelf, as shown by the dotted lines. When required for use,

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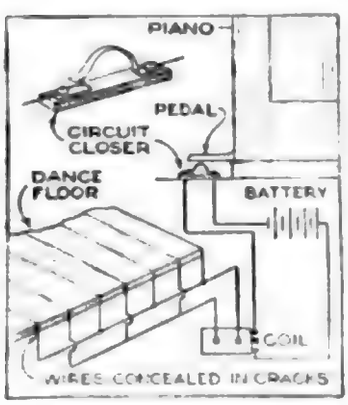
simply grasp the cord, pull the stand out, and set it up in position, as shown. Pieces of heavy wire may be mounted at the sides, if desired, so that the polishing cloth may be passed under them, or rollers may be added to facilitate this method of shoe polishing. When the work is finished, the stand is grasped by the vertical member, which is pushed under the shelf. Pushing upward on the horizontal piece of the stand, in the spot indicated, will bring the other piece tightly into position if the length of the vertical piece is correctly determined.—F. E. Leitch, Brooklyn, N. Y.

### Electrified Dance Floor

Quite a sensation, electrically and socially speaking, was created at a party dance by the arrangement shown in the illustration.

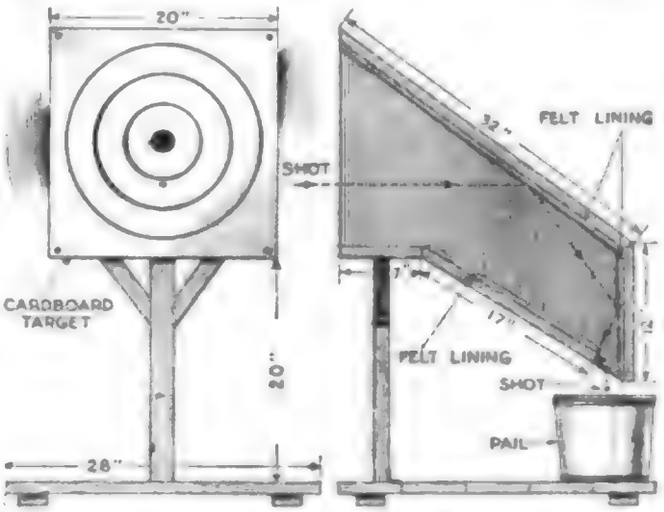



The sustaining pedal of the piano was fitted with a simple circuit-closing device made of two strips of brass fastened to a small board. This was so arranged that when the pedal was depressed, the circuit was closed to the primary of a ½-in. spark coil. The secondary terminals of the coil were connected to fine copper wires laid in the cracks in the floor. The dancers received a tingling spark every time the player pressed the pedal.

The fine wires in the floor cracks can be detected only by the closest observation, and a switch can be arranged to cut off the current when desired.—Thos. W. Benson, Philadelphia, Pa.

### Air-Rifle Target Saves Shot

A target of the kind shown in the sketch makes it possible to use the same ammunition repeatedly when practicing with an air rifle, and as the flight of the shot ends at the target, there is nothing to prevent indoor practice. The base, upright, and frame are made of wood, which can be taken from an old trunk, or packing case, and the slanting and vertical shields, which deflect the shot, are covered with strips of felt, or scraps of cloth, taken from an old coat and glued to the wood. Do not use tacks, as the head of a tack will flatten the shots. The face of the target is cut from cardboard, or heavy paper, and, if made about 20 in. square,

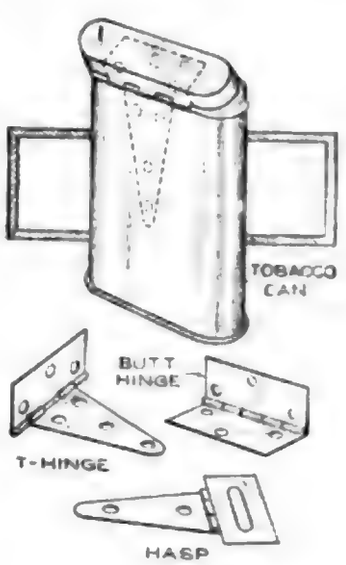



**A Slanting Board at the Rear of a Target Insures Both Safety and Economy at Rifle Practice**

is large enough for the range of most air rifles.—John P. Robinson, Santa Fe, New Mexico.

### Light Hinges from Tobacco Cans

A pair of hinges suitable for holding the lid of a small box, or the door of a fancy cabinet, can be made from two flat tobacco cans. The lid of each of these cans is secured by a pin, which acts as a hinge pin, and runs through tubular lugs on the can and lid. With tinners' shears cut the metal at each end of the pin, and be careful to leave the slight crimp in both can and lid which holds the pin in position. Cut the metal to form the hinges according to whatever design is needed; the sketch gives three varieties. Punch holes wherever necessary, and, if a hasp is being made, cut a slot along the lid of the can.—Harold E. Benson, Boulder, Colo.




¶ It pays to use plenty of varnish, especially on floors. When used on a vertical surface it must be put on in several thin coats; otherwise it will run. On floors it should be put on generously.

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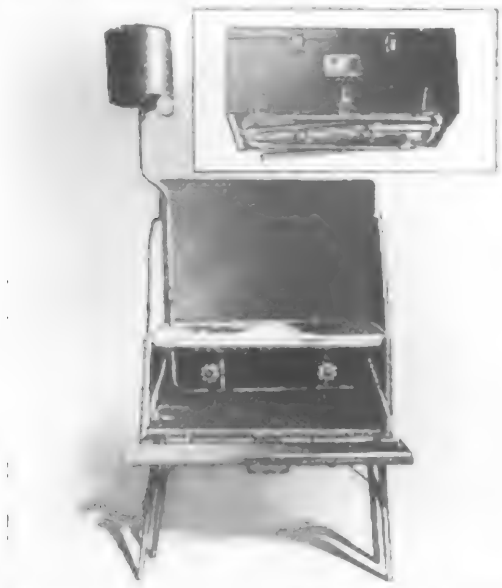
### A Folding Camp Stove

A camp stove, to be a success, must be light, compact, and easy to set up. It must also have some appliance for shel-



A Gasoline Stove Weighing 28 Pounds Is No Serious Encumbrance in a Camper's Outfit, and Eliminates the Labor of Building a Fire

tering the flame from the wind; and the stove shown in the illustration has all these qualities. It weighs 28 lb., measures 10 by 15 by 24 in., and can be set up or taken down in three minutes. The cover and two sidepieces make a windproof shield, and the hinged lid, which is uppermost when the stove is carried, drops forward when the stove is placed in position for cooking, and forms a shelf. To make it, purchase a small two-burner gasoline stove and wreck it, as these burners can hardly ever be bought separately. Use the top, burners, piping, and tank for the new stove, and make the rest out of light sheet iron. Rivets may be used throughout in putting it together, no soldering being necessary. One view shows the stove ready for cooking, and the other shows it folded for traveling. It will be observed that the sidepieces are hinged, and fall inward over the stove when the latter is being closed.

### Bottle Opener Formed from Key Blank

A bottle opener to be carried on the key ring is readily made from a key blank, suitable for the old-style door locks, by filing a hook into the bit of the key.

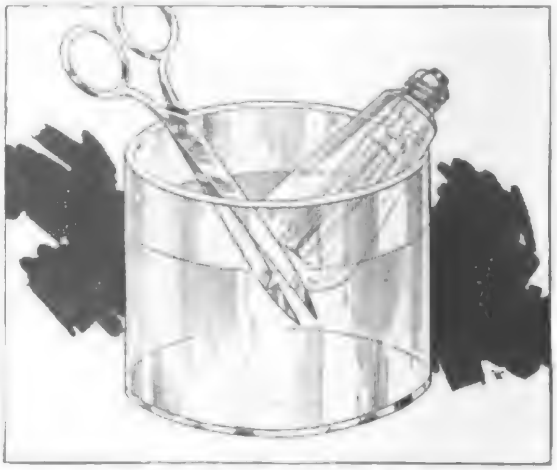
### Simple Method of Weighing Air

Finding the weight of air is an experiment which requires some careful work, no matter with what apparatus it is attempted.

Perhaps one of the simplest ways in which the amateur can perform the work is by means of a common burnt-out incandescent lamp, with the aid of a fairly sensitive balance. The use of the bulb makes unnecessary a vacuum pump, as it is already exhausted to a high vacuum.

First, weigh the lamp accurately on the balance; then hold it under water and break off the tip by means of a pair of scissors or some other piece of metal. It will immediately fill with water, leaving only a small bubble, which represents the air which was not exhausted from the bulb. When no more water will flow in, carefully weigh the bulb full of water, being sure to include the tip which was broken off. Now shake the water out, and carefully dry the bulb inside and outside; this is best done by warming it. The bulb is then carefully weighed, thus giving the third result.

To find the weight of the water, subtract the third result from the second; to find the weight of the air which would fill the same volume, subtract the first result from the third. These last are the two results which have to be obtained very accurately, since their difference will be small. Dividing the weight of the air by the weight of the water gives the



An Old Lamp Globe Forms a Very Convenient Vessel for Use in the Experiment of Weighing Air

specific gravity of air, which should come out about .0013 if the work is accurate.

An interesting question in connection with this experiment is whether

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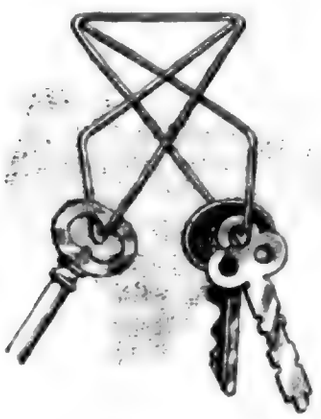
the first result or the third is the true weight of the bulb. Many persons would say at once that the first result represented the exact weight of the bulb, since it then contained not even air. From this, it would follow that the third result would be the weight of the bulb, plus that of the air it contains. However, since the bulb can be broken to bits, after the third result has been obtained, and the weighing of the pieces will still give exactly the same result, it is clear that the third result and not the first is the true weight of the lamp itself. The first result is, in fact, the weight of the lamp less the weight of the air which it would contain if it had not been exhausted. The case is similar to that of a balloon which is only partly filled with gas—the lightness of its interior buoys it up. The effect on the weight of the lamp is, of course, very small, but it is nevertheless a fact that a vacuum lamp will show, on the balance, a somewhat smaller weight than a gas-filled lamp of exactly the same size.—Victor H. Todd, Rainbow Lake, N. Y.

### Paper Clip Used as Key Ring

Large paper clips of the type shown make handy substitutes for key rings, and have an advantage over the ordinary ring in the fact that the two loops make it possible to divide the keys into bunches. In this way, keys which are constantly needed can be kept separate from those which are only used occasionally, and each key is easier to distinguish when it is one of a small group. Office keys can be kept separate from house keys, and all can be quickly found in the dark.—Elmer O. Tetzlaff, Chicago, Illinois.

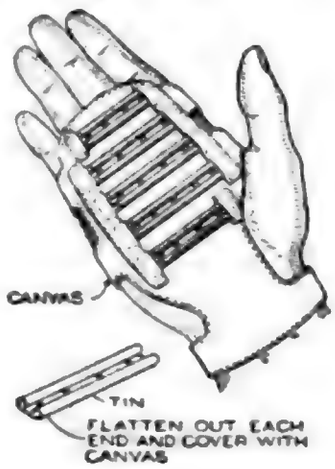


### To Keep the Hose Paired

Part of the labor of washing day—or the day after—consists in sorting the articles after the wash. The need of pairing stockings is removed if small snap fasteners are stitched at the tops, so that each pair can be snapped together, going through the wash as one article.

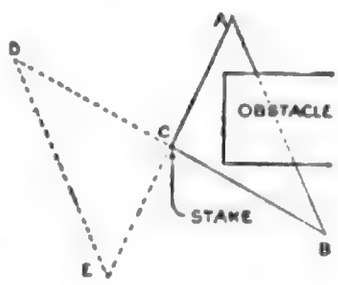
### Mittens Take Place of Washboard

For laundering handkerchiefs and other light articles it is not necessary to get out the washboard, large tubs, and other cumbersome paraphernalia which are used for a heavy "wash." A wash-basin or large dish will take the place of the tub, and for the washboard a pair of specially made mittens can be used. These take up no room, and save the knuckles from being worn by rubbing against the board. To make one of the mittens, cut four or five pieces of heavy duck and stitch them together, providing enough material to form bands or straps, which are fastened at the back of the hand and keep the mitten in position. Cut a few strips of tin, about 2½ inches long, roll the edges over as shown, and flatten the ends, so that they can be laid upon the palm of the mitten and held by strips of the material stitched at each end of the metal. Each hand in this way becomes a miniature washboard, and all that is necessary is to place the soiled articles in water, soap them thoroughly, and rub them a few times between the hands.—Riley Edwards, Cedar Rapids, Ia.




### To Measure through an Obstacle

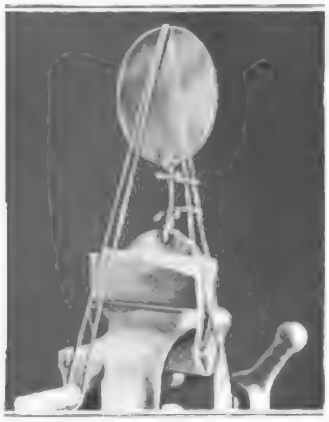
Many methods have been published for measuring the distance from one point to another when an obstacle intervenes which prevents stretching a tapeline. Certainly one of the simplest and easiest of such methods is that illustrated in the sketch herewith, in which A and B represent the objects whose distance apart is to be measured. Drive a stake at any point, C, and fasten a string to it, preferably tied to a nail driven in the stake. Stretch the string tightly to the point A. Holding this point with the finger, walk around to E, and, sighting across C and A to get a straight line, locate point E,



so that CE equals AC. Similarly, locate D so that CB equals DC. Then the distance from E to D is the same as the distance AB, which is sought. The fact is easily proved by the geometrical principles of vertical angles and equal triangles.—F. H. Sweet, Waynesboro, Va.

### Cementing Broken Eyeglasses

There are various kinds of glue and cement on the market, with which a piece of glass, such as a lens which has been broken in two, can be mended. It is not so easy, however, to hold the glass tightly in the correct position while the glue is hardening, without danger of breaking the glass anew. The photograph shows one way of doing this.



Several folds of soft paper are used to prevent the breakage of the unbroken lens which is clipped in the vise. The broken piece of the upper lens is placed in position with the proper amount of glue or cement, and rubber bands are employed as illustrated to furnish a steady but not too powerful pressure. The tension of the bands must, of course, be regulated so that the lens is held in just the proper position and not pulled over to one side, but this is easily done by sliding the nearer one of the two rubber bands along the vise.—Herman G. Cuthbert, Newark, N. J.

### Wet Paper for Fountain-Pen Wrench

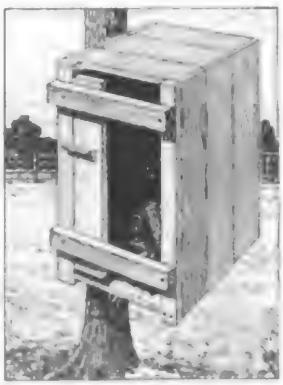
Most people who use fountain pens have at some time found difficulty in unscrewing the part which carries the nib. The hard-rubber surface is so smooth and unyielding that the fingers are unable to obtain a firm grip, so as to loosen the threads when they get stuck together. In such a case, fold a small piece of newspaper once or twice, to form a pad, and moisten it; then place the damp surface against the front part of the pen, take a firm hold, and turn.—K. McLean, Caledon, South Africa.

### Handy Tool from Umbrella Rib

A very convenient tool can be made from a piece of an old umbrella rib, and can be used for delicate repair jobs on a piano, and also for lubricating intricate machinery. File one end on the convex side, holding the file at an angle, so as to form a fork, or crotch, at that end of the rib. File the other end on the concave side, still holding the file at an angle, so that a single point will be formed at that end. The tool is then complete, and can be used in a variety of ways. A hammer-butt spring or jack spring, for example, can be replaced on a piano by using the crotch end. In oiling complex machinery, parts that cannot be reached with an oilcan may be lubricated by resting the pointed end of the rib on the bearing, or oil hole, and pouring the oil along the channel formed by the grooved or concave side of the rib. —Jack Solon, Natchez, Miss.

### Catching Wild Young Cattle in a Trap

When young cattle run all summer on large pastures in isolated places, they sometimes become quite wild, so that it is difficult to get them into the corrals, or feed lots, in the fall. For one reason or another it may not be desirable to run them down with a horse, or rope them cowboy-fashion, so that more gentle methods become necessary. One of these is the following:



A strong box is made, and firmly fastened to a tree. Some ear corn, or other bait, is placed inside the box. Two 2 by 4-in. pieces are bolted across the front of the box, one near the top and the other near the bottom. A piece, 2 by 6 in., is cut 6 in. shorter than the box and hinged to one front corner post, so it will swing inward. A light spring holds this hinged, upright door against the two crosspieces. Wild range calves will snoop around such a box, and the leader of the bunch will finally put his head inside. In doing so the door will be pushed open until the animal's head passes it, when the spring will pull the door shut and the calf will be held as in a stanchion.

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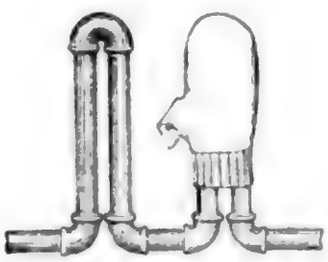
It is well to watch the performance from a distance, because one of the smaller calves might get caught. In that case the larger ones may attack it.

The width between the uprights of the stanchion when closed should be about 7 in. The box should be about 3 ft. high by 2 ft. wide, and the bottom should be set 12 to 18 in. from the ground.—Herbert A. Shearer, Chicago, Ill.

### Heat-Coil Mitten Drier

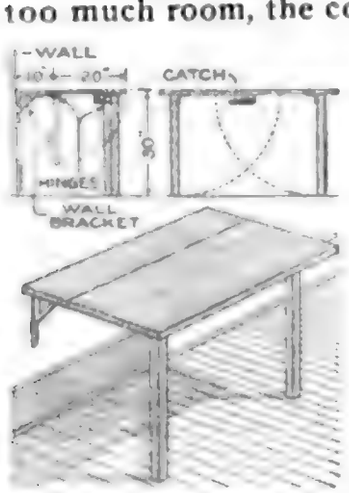
A discomfort familiar to many is that of putting on leather or other heavy mittens or gloves that have become damp on the inside with moisture from the wearer's hands, or from melted snow. Placing them in some warm place will dry them on the outside, but not on the inside, unless they are left for a considerable length of time.



Where a warm-water line is available, a very efficient drier can be easily and cheaply constructed, as indicated in the drawing. A pair of wet gloves or mittens, dropped over these upturned pipes, will dry quickly and thoroughly. If it is ever desired to draw the water from such a line, a drip cock or other outlet should of course be provided at the lowest point in the middle section.

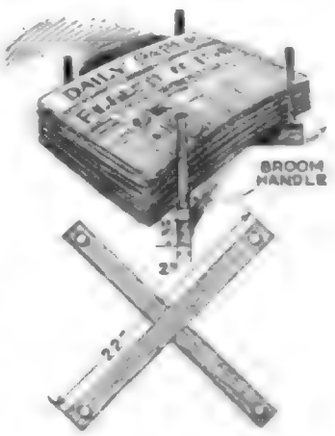
### Combination Shelf and Table Takes Little Room

In a place where a table would take up too much room, the combination shelf and table illustrated may be used. A shelf 10 in. wide, is put up 30 in. above the floor with brackets, in the ordinary way. To this is hinged a board, 20 in. wide, having hinged legs that fold up and are held close against the underside of the board with a button catch. This table can be put up in a few minutes, and takes but little room.—Fred Doremus, Garfield, N. J.



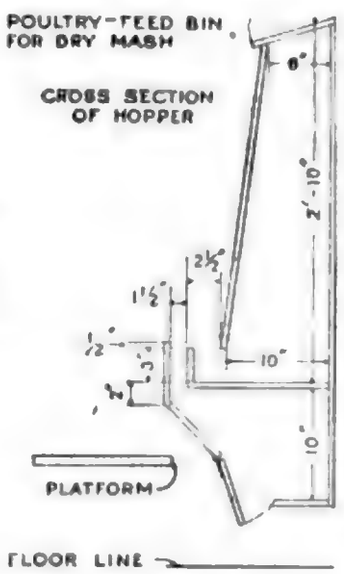

### Rack for Collecting Newspapers

Families which make a practice of saving newspapers in order to sell them later, will find it a good plan to use a rack for storage, rather than a drawer or cupboard, as the capacity of the rack is usually greater. A very simple one can be made out of two short pieces of wood and four broom handles, by means of which the papers can be stacked to a height of about 4 ft. The two pieces of wood cross each other at a right angle to form the base, and are sunk, or mortised, into each other at the crossing. Before starting the pile, lay two strings or cords across each other on the base, and when the stack is complete the strings can be tied together at the top, to make a neat bundle.




### Poultry-Feed Bin Prevents Waste

With the ordinary poultry-feed bin, there is always more or less waste of grain, because the chickens, while pecking at the grain, are sure to spill some of it over the edge. A bin built like the one illustrated will save nearly all of this wasted grain, as it does not fall onto the ground, but merely into a lower compartment, from which it may be removed, when necessary, by opening the door and replacing it in the upper compartment. The dimensions given are, of course, only suggestive, as the material available for building the bin may largely determine its size.




¶ Kerosene, evaporating from a small jar placed in a clock, produces a lubricating vapor which makes the clock keep better time.

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### Typewriter Stand and Copy Rack

The old sewing machine shown in the photograph is now giving good service as a typewriter stand. Such tables can

An Old Sewing Machine Supports Both the Typewriter and a Copy Holder, Made from Parts of a Worn-Out Typewriter

be obtained quite cheaply. Since the sewing-machine table was too high for use with the typewriter, the legs were sawed off to the proper length, and smooth gliders were attached to the bottom of the legs, so that the stand would slip easily over carpets. The iron legs were given a coat of bicycle enamel, and the woodwork a coat of shellac, thus completing a nice-looking piece of furniture. The drawers were found quite useful for keeping supplies and stamps.

To the right of the typewriter, on the stand, appears a copy holder, which was made a part of the stand. It is made from a pair of rolls, taken out of a worn-out typewriter. The writing to be copied is held between the rollers, and these can be turned up slightly after each line, to prevent the operator having to search for the place.—M. L. Lowrey, Livermore, California.

### Canopy Protects Window from Rain

A house which stood in an exposed situation was rendered almost uninhabitable on one side by rainstorms. The driving rain entered at the upper edges of the window casings, and ran down the inside of the walls to the floor, ruining the carpets. The owner cured the trouble by placing a small metal canopy over each window. He cut a piece of galvanized iron six inches longer than the width of the casing, and three times as wide as the exposed part of one of the clapboards. He then secured it above the window by thrusting one of its long edges between the second and third clapboards above the top of the casing, and hammering half a dozen small nails through it into the wood. It then hung down at an angle of about 30° to the vertical, and completely protected the top of the window. The portion of the iron which entered between the clapboards was bent at an angle to the rest of the material, and another bend was made in the opposite direction at the lower edge, so that the water would flow off easily.—Mrs. Cora Hamilton, Binghamton, N. Y.

### Seasoning a New Tobacco Pipe

More men would smoke a pipe if they could prevent the rank taste which is so noticeable when a new pipe is being broken in. This can easily be avoided if the following directions are observed. Before the pipe has been smoked at all, fill the bowl with water, and allow it to stand for a few minutes. Then pour out the water, and while the bowl is still moist, load it with tobacco, and smoke. If this is done, a thin cake will start forming from the first pipeful.—J. C. Bailey, Peru, Ind.

### An Electric Warming Pad

An efficient electric warming pad, to be used for the same purposes as a hot-water bottle, may be made, as illustrated, from materials which are readily procurable at electrical-supply stores. It is designed for 110-volt current, direct or alternating, and will consume about 50 watts, costing about as much per hour, for current, as an ordinary incandescent lamp.

The heating element consists of 27 ft. of No. 32 nichrome wire. This is first wound like a coil spring around a steel rod; as the rod is removed, asbestos cord is run through the coil to prevent the turns of wire being mashed flat. The cord should be $\frac{1}{16}$ in. in size, and about 18 ft. will be required. When the coiling of the wire is completed, it is drawn out to the full length of the cord, and is drawn through a length of asbestos tubing. The tubing should be of $\frac{1}{8}$-in. inside diameter, and $\frac{7}{16}$-in. outside. The

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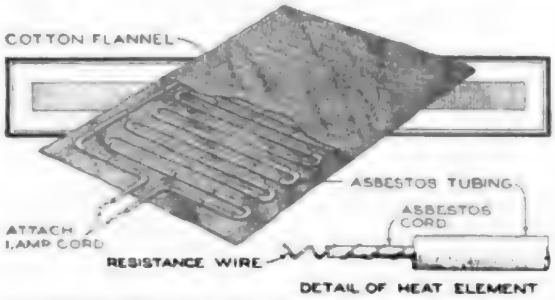
wire and asbestos cord are drawn through by means of a string, which is first put through with a headless nail, or other slender weight, hung at its end. The tubing is then bent to a shape such as illustrated, and sewed on a piece of cotton flannel, another piece of flannel, sewed on the other side of the tube, completing the pad. The ends may protrude as shown, with flexible lamp cord soldered to the resistance wire, and the joints should be well taped; or, if provision is wanted for renewing the lamp cord when worn, use two blocks of ¼-in. fiber, fastened together with screws, with other screws as binding posts. The current-carrying screw heads and wires should all be set in hollowed-out spaces between the two fiber blocks, so that no conducting metal is exposed, and the blocks are then sewed in at the edge of the pad.—E. Alpha Dean, Chicago, Ill.




**An Electric Warming Pad, Using Current from House-Lighting Mains, Takes the Place of the Hot-Water Bottle**

## A Rustic Summer House

The return of fall—the ideal time for nutting parties and little picnics to a near-by woods—is also the opportune time to gather material for a summer house. During a few hours in the woods, and a few more with a hatchet and saw, the rustic house may be realized. It may be constructed while the pieces of wood are still "green," or, better still, next spring when dried out. During the winter months, they may be sawed into proper lengths in spare time.

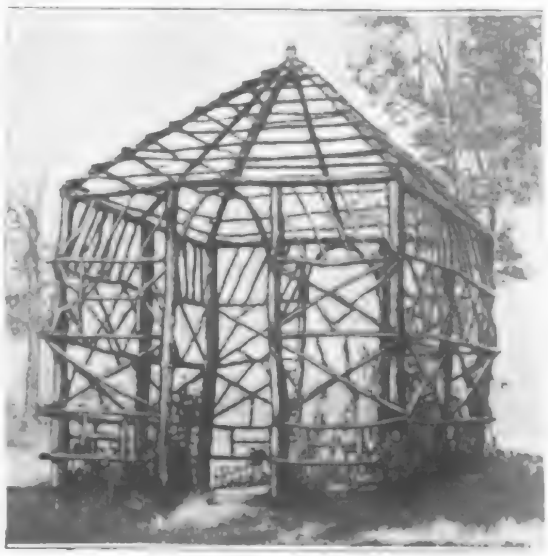
The illustration and material list give an idea of what is required to build a substantial house. Three or four wisterias planted on the sides will make ample covering for years. Honeysuckle, or any other quick-growing vine, may be planted.

The material listed below is sufficient to construct a summer house 10 ft. square. First, square off one end of the upright posts, and set them about 36 in. deep, taking care to have the tops level. Next, the four strips are nailed around the top of the uprights with spikes or wooden pins. The ridges are adjusted, meeting at the center against an octagonal piece, with a globe or other ornament for the tip. The lateral strips forming the roof may then be nailed into place. The horizontal strips are fastened around the ends and sides, as shown in the photograph. The shorter lengths are then placed as shown, the photograph showing the various positions, which may, of course, change according to preference. It is well to flatten all pieces where they are to rest against each other.

If desired, a drinking fountain may be placed in the center of the house, on a concrete slab. Rustic benches on the sides, with a chair or two, will make room for comfortable entertainment of a dozen.

**MATERIAL REQUIRED**

10 pieces, 4 to 6 in. in diameter, 11 ft. long, used as uprights.
4 pieces, 3 or 4 in. in diameter, 10 ft. long, at base of roof.
8 pieces, 2 or 3 in. in diameter, 7 ft. long, used as rafters to support the roof.
32 pieces, 1 in. in diameter, ranging from 2 to 10 ft. in length, to form the roof. If made longer, the scrap may be used in various places.
8 pieces, 2 or 2½ in. in diameter, 10 ft. long, for sides.
16 pieces, 2 or 2½ in. in diameter, 3½ ft. long, for ends.
60 pieces, 1 in. in diameter, 3 ft. long, used on sides and ends.
20 pieces, 1 in. in diameter, 3½ ft. long, for sides and ends.
2 pieces of wild grapevine, about 2 in. in diameter, for arched doorways.



**A Summer House Built of Branches of Trees Is Quite Pleasing to the Eye, as Well as Inexpensive to Make**

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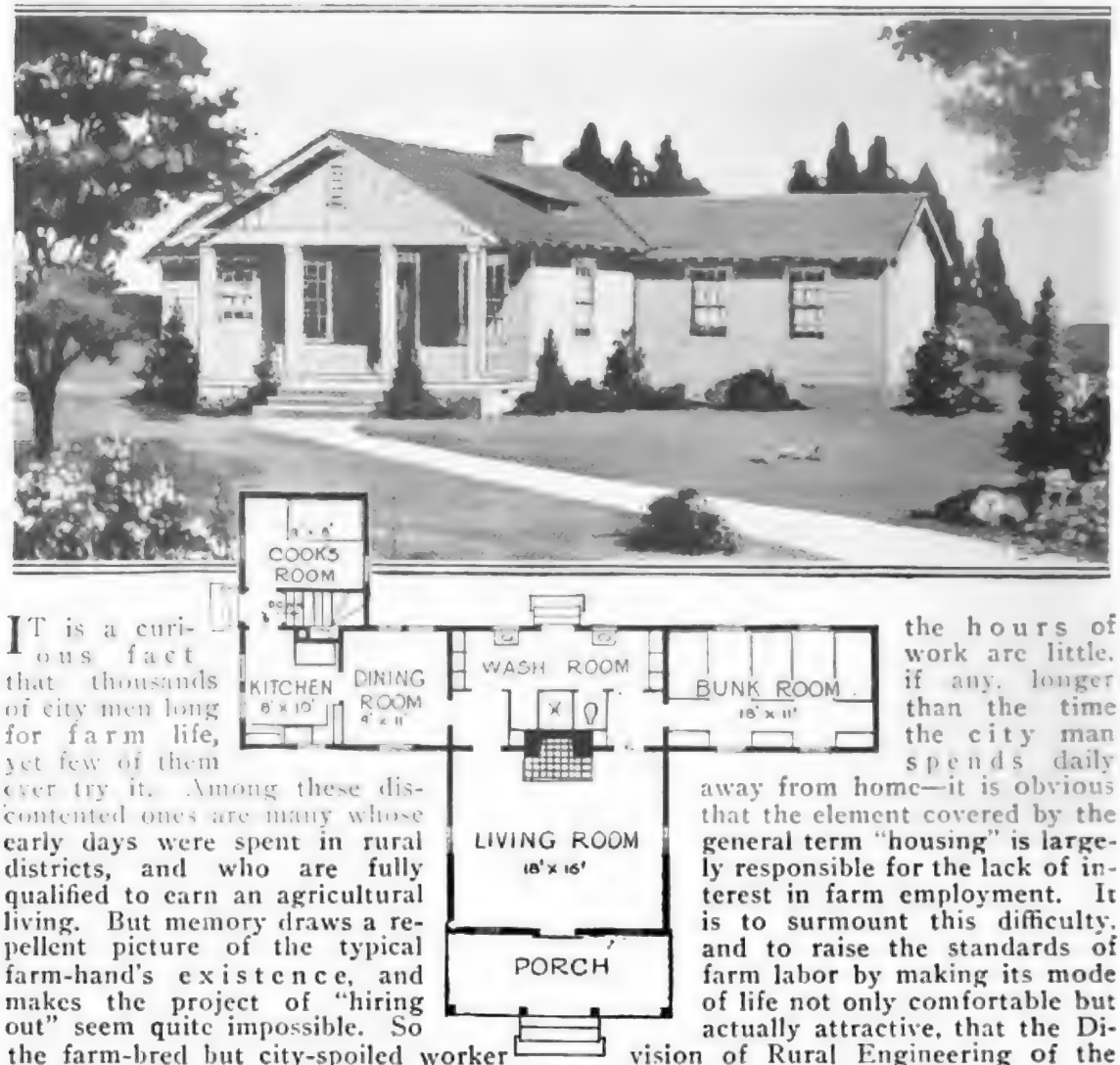
# BUNKHOUSE THAT SOLVES FARM-LABOR PROBLEMS




IT is a curious fact that thousands of city men long for farm life, yet few of them ever try it. Among these discontented ones are many whose early days were spent in rural districts, and who are fully qualified to earn an agricultural living. But memory draws a repellent picture of the typical farm-hand's existence, and makes the project of "hiring out" seem quite impossible. So the farm-bred but city-spoiled worker dismisses the idea of going back until that hypothetical time when he may acquire a few acres of his own. And that time seldom comes. Meanwhile, the farm owner is at his wits' end to get labor of any kind, and to keep it when he has it. For no competent worker will remain long content with quarters in the barn, and even a billet in the house with the farmer's family conveys no sense of permanency, but rather induces the worker to regard himself as a transient.

Since farm labor is not disagreeable—the net funds in pocket compare very favorably with those of city life, and even the hours of work are little, if any, longer than the time the city man spends daily away from home—it is obvious that the element covered by the general term "housing" is largely responsible for the lack of interest in farm employment. It is to surmount this difficulty, and to raise the standards of farm labor by making its mode of life not only comfortable but actually attractive, that the Division of Rural Engineering of the Bureau of Public Roads, Department of Agriculture, has designed a series of farm bunkhouses such as the one illustrated here. This inexpensive dwelling, the division's design No. 1029, normally accommodates three men almost in luxury. With double-deck bunks, six men are made comfortable, and in the stress of harvest time the big living room may temporarily be given over to as many more. Entrance from the fields is through the wash room, where there is a shower and warm water—an important detail.

The government office named above is prepared to supply working drawings of these bunkhouses without charge.

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# Popular Mechanics Magazine

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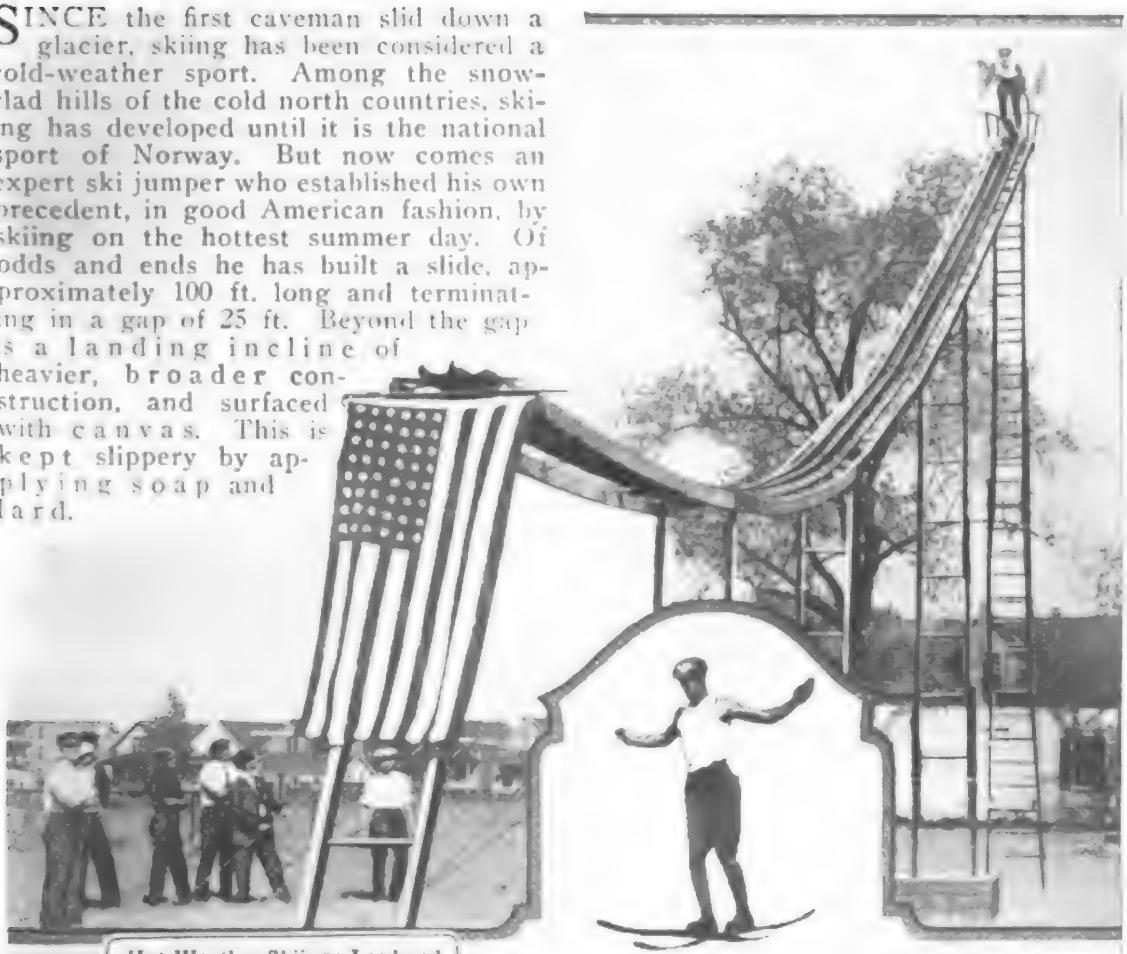
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 NOVEMBER, 1919 No. 5

## Ski Jumping in Summer Expert's Sport

SINCE the first caveman slid down a glacier, skiing has been considered a cold-weather sport. Among the snow-clad hills of the cold north countries, skiing has developed until it is the national sport of Norway. But now comes an expert ski jumper who established his own precedent, in good American fashion, by skiing on the hottest summer day. Of odds and ends he has built a slide, approximately 100 ft. long and terminating in a gap of 25 ft. Beyond the gap is a landing incline of heavier, broader construction, and surfaced with canvas. This is kept slippery by applying soap and lard.



Hot-Weather Skiing: Lard and Soap Make the Slide, Depicted Above, as Slippery as an Ice-Covered Hill. Zest is Added to the Sport by a Leap across a 25-Foot Gap Shown Below

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These Three Views of the Mid-Air Collision were Filmed from a Third Airplane. The Upper Shows the Acrobat About to Set Foot on the Lower Plane

A Second Later a Gust of Wind has Flipped Up the Right Wing of the Lower Plane. It Is About to Lock with the Upper Undercarriage

The Acrobat Clutches the Rope as the Two Planes Drop to Earth. Miraculously Neither Pilots nor Acrobat were Killed

PHOTOS BY GILLIAMS SERVICE

**Beside One of the Wrecked Planes Stands the Acrobat, Smiling and Unhurt after an Adventure without Precedent in the History of Aviation**

## AIRPLANES CRASH IN MID-AIR AS CAMERA MAN TURNS CRANK

Airplanes have collided in mid-air. Sometimes the airmen have reached the ground in safety; but never until recently had such a miracle been recorded by the camera. The two planes, with a third to carry the camera man, had been chartered for work in a motion-picture drama. At a height of 2,200 ft. a fearless airman-acrobat in the upper plane lowered himself on a rope which trailed from the undercarriage. The second plane approached; the dangling acrobat gathered himself to leap upon it. At that moment a gust of wind flipped up the right wing of the lower plane, locking it with the landing gear of the other. In this fashion the two shot down together, the forlorn acrobat clutching his rope, the imperturbable camera man in the third plane filming every move. At 1,200 ft. the planes jerked apart, the pilots "leveled off" and guided their twisted machines to earth. Both crashed again on landing, yet no one was killed.

## DEFLATED ROWBOATS CARRIED IN ONE HAND

Many a vacationist during a summer in the north woods has watched his brawny guide balance the canoe upon his shoulders and carry it thus over a trail of several miles. For the sportsman intent on only a few days' pleasure, however, such a feat is distasteful when not impossible. For his benefit have now been built two small boats that he can carry 12 hours a day without exhaustion. One is the invention of an Englishman. It weighs but 18 lb. and collapses to the size of a small handbag, yet its canvas bottom easily holds a heavy occupant. Each of the four sides is formed of an air-tight bag which is inflated by a hand pump. To the gunwales are fitted locks for the two paddles or oars. The second featherweight boat is more complex in construction but easier to paddle. When collapsed it fits into a wooden box, about the size of the case that is used to hold the popular croquet mallets. Two air-filled bags give buoyancy to the craft, and support the wooden framework with its comfortable seat and emergency air pump. This second craft is really of the "catamaran" type, popular with the natives of many tropic lands. The air-filled bags replace the clumsy logs.

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**The Sportsman Equipped with This Canvas Rowboat Needs No Boathouse to Shelter His Craft. As He Inflates It with the Little Hand Pump, as Shown Above, It Grows from a Limp Mass of Canvas to a Rigid, Water-Tight Craft. When the Day's Shooting or Other Sport is Ended, He Opens the Four Air Cocks, Folds Up His Boat, and Carries It Home**

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**Paddle, Seat, Air Pump, Frame, and Bags, All Fit into the Traveling Case at the Left. This Second Type of Collapsible Boat is Propelled with a Two-Bladed Paddle. Between the Knees of the Paddler, at the Right, is Fitted a Pump with Which the Bags or Pontoons may be Inflated While on the Water**



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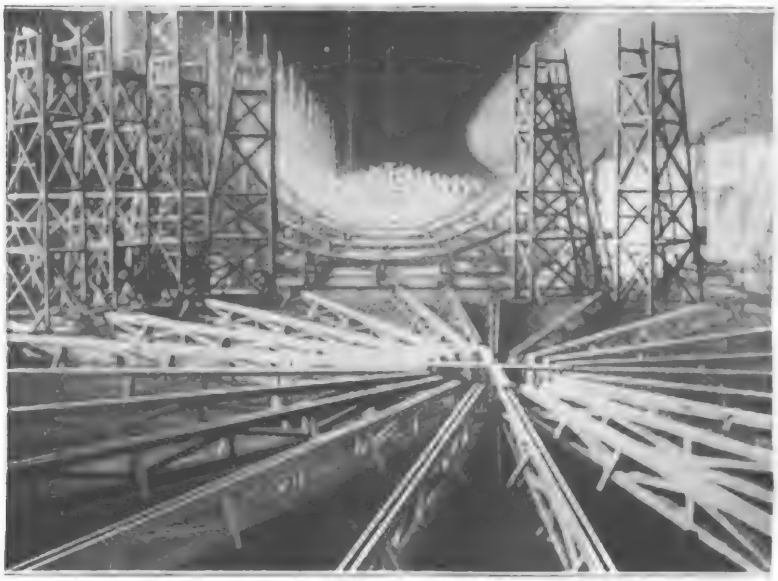
# BRITISH BECOME EXPERT IN THE ERECTION OF HUGE RIGID AIRSHIPS

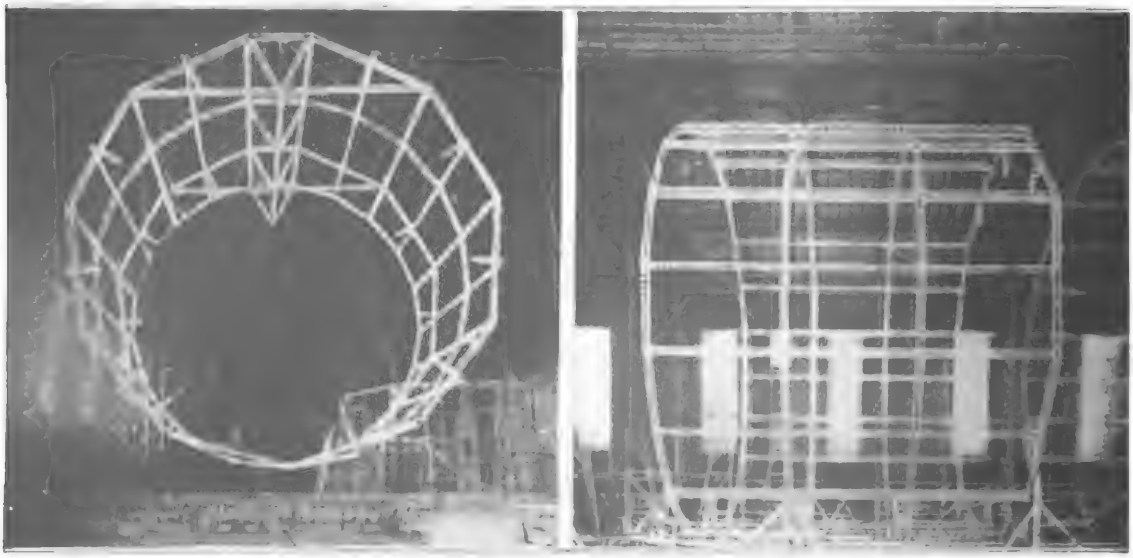
By PAUL A. JENKINS

FEW Americans who witnessed the dramatic arrival and departure of the transatlantic airship "R-34" realized that it was the product of a new and spectacular British industry, ranked as the foremost of its kind in the world. Under the pressure of war have been built specialized machines, have been trained thousands of operatives for every one of the processes used in making the great frames, the gondolas, gas bags, outer fabrics, and engines. In out-of-the-way corners of the island empire have been built monster sheds, some a sixth of a mile long, where workers have grown skillful in assembling the 1,600,000 pieces required for the construction of each giant air liner.



This Photograph Reveals Two of the Secrets of British Airship Construction. In the Foreground is Seen the Radial Jig on Which the Girder Rings are Assembled. Stretching Away into the Background Are the Cradles Which Permit Easy Manipulation of the Giant Skeletons

This assembling of the myriad little parts into the vast rigid framework of an airship like the "R-34" is now accomplished in each of these sheds with a facility gained from many previous failures and discarded processes. First of all are assembled, upon a radial jig, the ringlike girder frames which give the completed airship its transverse rigidity. Due, of course, to the streamline profile of the great hull, the rings vary in diameter, from a few yards for the small frames at bow and stern, to a maximum of 80 ft. for those in the central sections of the ship. The assembling jig is consequently fitted with saddles which slide upon radial arms and may thus be adjusted for the construction of a frame of any size. When four such frames have



A Unit of the Giant Skeleton is Suspended Upside Down at the Left. At the Top is Clearly Seen the Triangular Internal "Keel" Which Permits the Crew to Walk, as in the "R-34," from One Gondola to Another. At the Right, a Unit already Rests upon the Cradles, Where It can be Turned Like a Revolving Squirrel Cage



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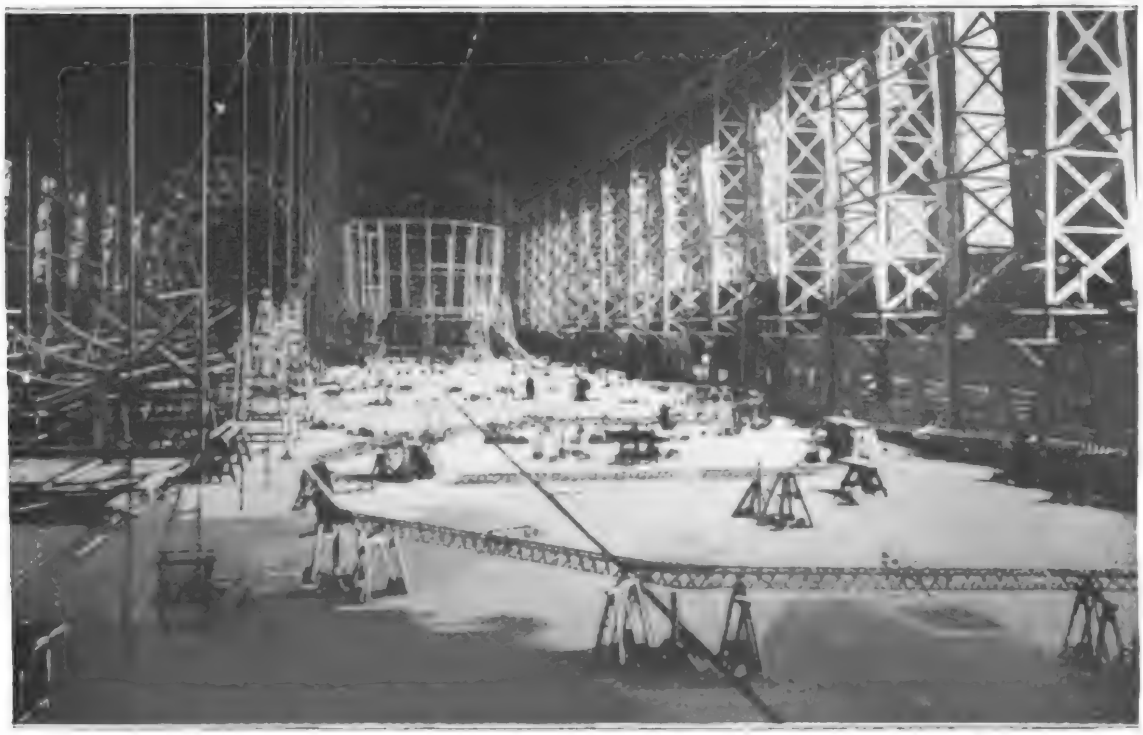
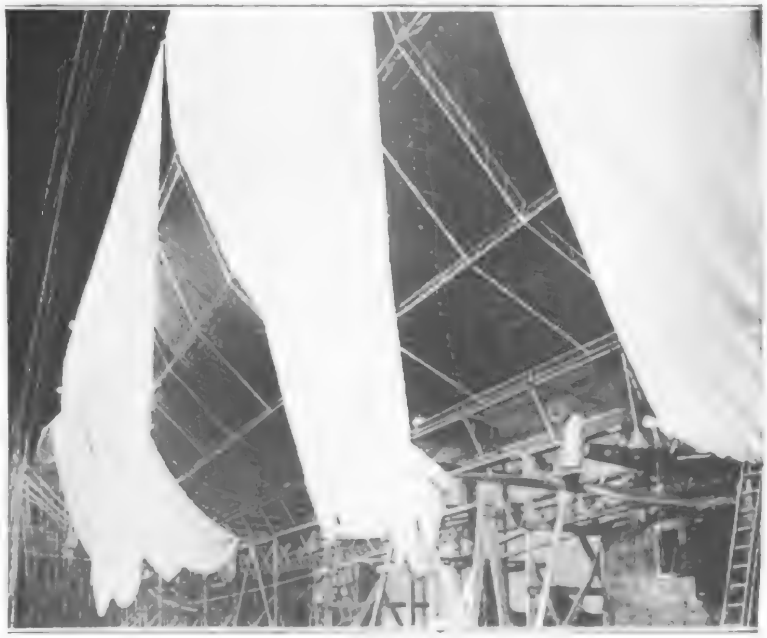


This Striking View of a Great British Airship Shed Illustrates Completely Three Steps in the Process of Airship Construction. The Girder Ring in the Foreground has been Assembled on the Radial Jig. Rising in the Central Background Is an Unfinished Unit of Four Such Rings, Now Joined by Longitudinal Girders. To the Left is seen a Finished Unit Which has been Turned on Its Side and Now Rests on the Cradles

been put together they are rigidly wired and joined, one on top of the other, by longitudinal girders.

As it is completed, each of these structural units of four frames is gently lifted by overhead tackle, turned on its side, and lowered upon circular segmental cradles adjacent to a similar unit. These cradles are in themselves worth noting, being provided with rollers to permit the easy revolution about its horizontal axis of any or all the units. Cumbersome staging is thus unnecessary, the workers simply revolving the huge framework when they desire to work on top or sides, and all heavy work is performed at ground level.

When all these units or sections of the framework, perhaps seven or eight in number, are in place on the cradles they are riveted together to form the completed skeleton of the airship. Bracing wires are strung and tightened from bow to stern; fins, rudders, and elevators are fitted; the 18 or 20 individual gas bags are inserted, and the outer envelope of



Here the Airship is Nearing Completion. Bracing Wires Are All in Place, the Individual Gas Bags have been Inserted and Inflated. At the Right a Gondola has been Affixed to the Frame. The Fabric Covering is About to be Laced Tightly about the Long Hull

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linen stretched over the hull. While this covering is being laced and weatherproofed, the gas bags are gradually inflated with hydrogen, the new airship lifts itself from the cradles by its own buoyancy, and workmen are able to attach to the bottom the control gondola and the two, three, or four "power eggs." Navigating instruments and crew accommodations are put aboard, the engines tested, and the airship is ready for its first flight.

## GREAT NAVAL VESSEL DRIVEN BY ELECTRIC MOTORS

America's new superdreadnaught, the "New Mexico," is the first naval creation of its class to depend entirely upon electricity for propulsion, and to be equipped completely for utilizing this form of energy in the performance of practically every task on board. The four ponderous screws which drive the ship are turned by a like number of electric motors, capable of developing 28,000 hp. These receive current from two great turbine-driven dynamos, each producing 14,000 hp. Nine oil-burning boilers produce the steam used in the turbines, as well as in six other smaller turbo-generators, located in different parts of the craft. The latter furnish current to the hundreds of electrical devices installed on the vessel, including the steering mechanism, a ventilating and heating system, and the gun pointers. Even the kitchens are equipped with electrically operated conveniences. A distilling plant produces 30,000 gal. of pure water daily, and a refrigerating system freezes six tons of ice in the same length of time. The "New Mexico" is 624 ft. long, has a beam of over 97 ft. at the water line, and weighs 32,000 tons. About 1,000,000 gal. of oil can be stored in the tanks provided. During a recent trial the boat exceeded a speed of 21 miles an hour.

The advantages of electrical propulsion for ships are increased economy, flexibility of control, reliability of operation, and protection of the working elements from damage. The "New Mexico's" tests showed a gain of 20 to 30 per cent in fuel economy over similar ships direct-driven by turbines. Flexibility and reliability are obvious consequences of the electrical way. And with each driving unit in its own protected cell, torpedo or mine could do its worst at that particular point without accomplishing more than to reduce the ship's speed by an amount that would not seriously cripple it.

The "New Mexico," a Superdreadnaught Driven and Controlled by Electricity, as It Appeared in the New York Navy Yard a Short Time after Its Completion

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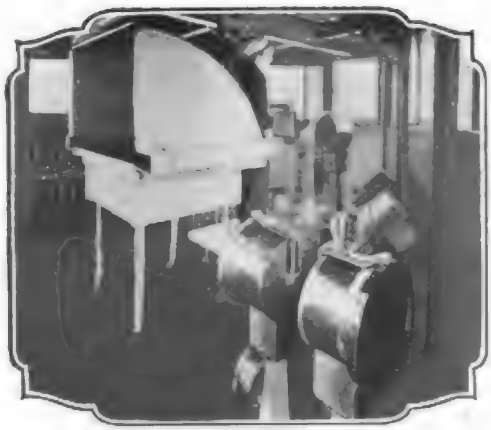
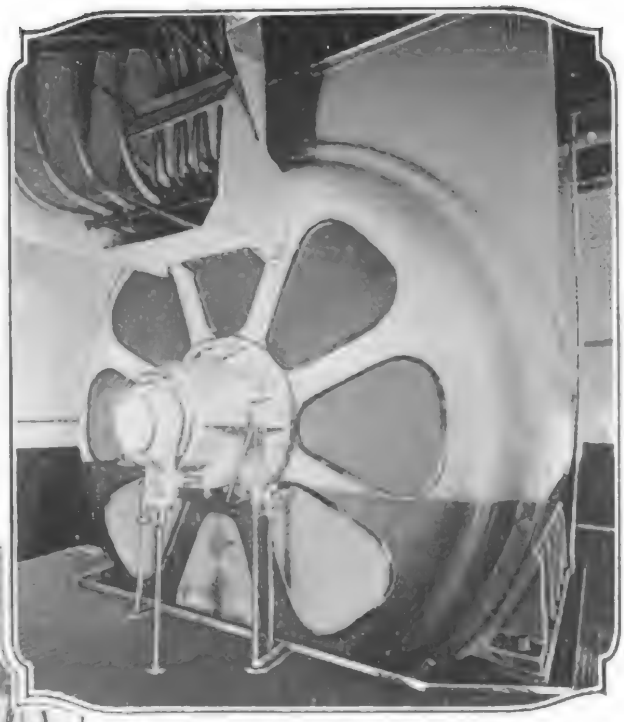
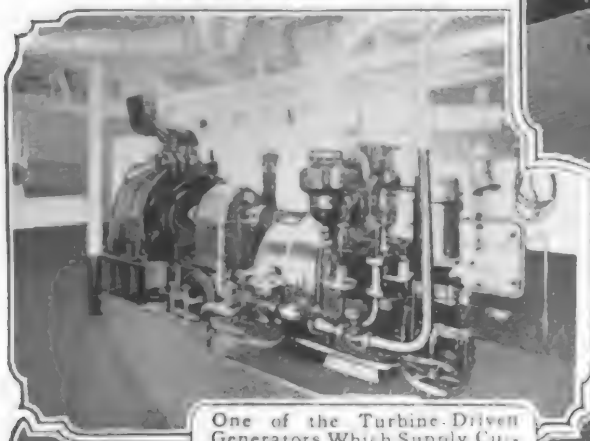


Navigating Bridge of the "New Mexico," Showing the Steering Device and the Apparatus for Transmitting Signals to Different Parts of the Vessel

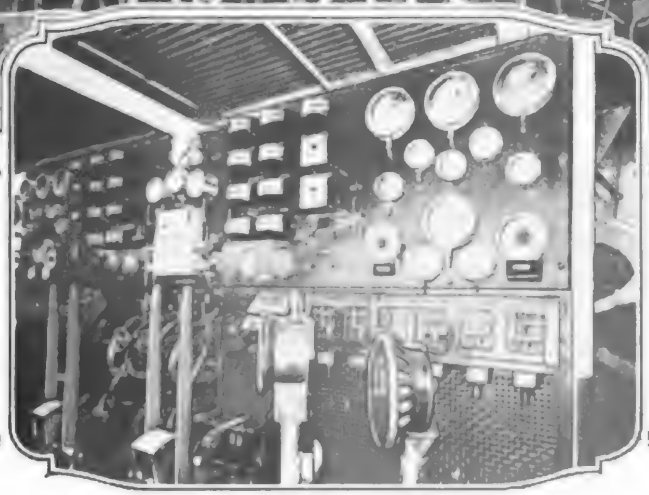


Four of These Great Motors Propel the Superdreadnaught. Each One Develops 7,000 Horsepower, and Is 12 Feet in Diameter. Their Use Eliminates Gears for Controlling the Ship's Speed



One of the Turbine-Driven Generators Which Supply Current for Lighting and Operating Electrical Machinery on Board: Six of These Deliver 2,400 Horsepower

Some Idea of the Size of the Propellers can be Obtained from the Illustration Above, Which Shows Sailors Sitting on the Giant Screws That Drive the Mammoth Craft Through the Water



On the Left Is a View of the Main Switchboard, through Which Electric Current from the Dynamos Passes on Its Way to the Motors That Turn the Propeller Shafts



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## CANADIAN DEVELOPS SYSTEM FOR RAISING QUEEN BEES

Queen bees are highly important members of honey-gathering swarms, and the rearing of these egg-laying females is a highly specialized branch of apiculture, in which scientific methods are employed. A Canadian expert in this line has devised a new system for safeguarding the larvæ of queens, and for protecting the young bees during the early stages of their winged lives. When a larva cell is one day old, it is removed from the comb by a cylindrical cutting instrument, from which it is pushed into a short protective tube. The latter is then replaced in the comb, and left until the cell has been completed. A finished cell can be taken from the tube without injuring the larva, and placed in a cylindrical cage of wire mesh, in which the bee hatches and remains until full grown. An opening at the bottom of the cage permits feeding.

**Queen-Bee Rearing: On the Left the Man is Cutting Larvæ Cells from a Comb. In Front of Him Are Several Hatching Cages. Above is Pictured a Comb Containing Completed Cells, While Below, at the Right, a Cell is being Inserted in a Protective Tube**

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¶A unique radio experiment recently conducted on Long Island Sound forecasts a close coöperation between seaplanes and submarines in the next war. Trailing its antenna 2,000 ft. above the water, the seaplane was able to communicate both by telegraph and telephone with the submerged submarine. Naval officials believe that this union of aerial and subsurface units is destined to be a factor in the coast defense of this country, like the liason between air and land forces.

## "NEW" BRITISH-CANADIAN CABLE ONCE GERMAN-AMERICAN

Great Britain now has communication with Canada by means of a newly laid submarine cable extending from Penzance, on the extreme southwestern point of England, to Halifax, Nova Scotia. It has just been revealed, however, that the cable is new only in point of location and service. It transpires that the long underwater conductor is the one that formerly connected Emden, Germany, with Coney Island, New York, by way of the Azores. The transfer from German control took place in July, 1917, after which it was used by the British government for all official war business with Canada. Now it is in commercial service, forming a link in the England-to-Australia line.

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## EASY TO FOCUS HAND CAMERA FITTED WITH NEW FINDER

By making the finder attached to a hand camera big enough to show a full-size image, and fixing the finder lens on the front board of the camera, just above the regular lens, a western inventor has solved the problem of accurate focusing. A 45° mirror reflects the view to a horizontal ground glass, where it is shaded by a folding hood and seen right side up. Mirrors on the hood allow the ground glass to be seen with the camera held in either of the usual positions. The two lenses move, and consequently focus, together. The whole attachment folds inconspicuously against the front of the camera case when the latter is closed, adding little to its bulk.

**Combined View Finder and Focusing Apparatus Which Gives a Full-Sized Image: In Use, the Folding Hood is Extended as Shown in the Picture on the Left. Above the Device is Seen Folded**

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Front Elevation of the Illinois Centennial Building, Showing the Great Recessed Portico: The High Arched Windows underneath the Columns will Serve to Light the Enormous Hall, Which will be Located on the Ground Floor

## IMPOSING MEMORIAL BUILDING PLANNED FOR ILLINOIS

An imposing and beautiful structure is to be erected at Springfield, the capital of Illinois, to commemorate the admission of the state into the Union 100 years ago. The building will be 300 ft. long, 100 ft. high, and 100 ft. wide, with a base of granite and a superstructure of limestone. Over the ground floor in front, a great recessed portico, extending nearly the length of the memorial and containing 12 massive marble columns, will serve as an impressive decoration. The interior will be divided into a high-ceilinged hall, 150 ft. in length, a mammoth library and reading room, and historical museums, one of which will be devoted to relics of Abraham Lincoln. Both the interior and exterior will be embellished with sculptural representations of incidents in the history of the state. The official Centennial celebration was held in Springfield, Oct. 1-6, 1918.

## MASSIVE BRONZE CHANDELIER ADORNS MISSOURI CAPITOL

Suspended in the rotunda of the new Missouri State Capitol at Jefferson City is a ponderous bronze chandelier, declared to be the heaviest lighting fixture in the country, as well as one of the most elaborate and costly. It weighs 6,500 lb., and is about 40 ft. high and 14 ft. in diameter. The value is $5,000. There are 150 incandescent lights on the fixture, arranged so that no shadow is cast in any direction. These bulbs consume about 5,000 kw. of current an hour. Chains hold the chandelier 160 ft. above the floor, and a windlass is provided for raising or lowering the massive crea-

Bronze Chandelier in the New Missouri Statehouse: The Fixture Weighs 6,500 Pounds and Bears 150 Incandescent Electric Lights

tion. The building which it adorns was erected at a cost of over $3,500,000, and is one of the finest edifices of its kind.

¶An unofficial world's altitude record was recently established by Roland Rohlfs in a Curtiss airplane. He rose 34,500 ft., or more than six miles.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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New Highway Bridge of Reinforced Concrete, to be Built across the Willamette River in Oregon: The Length of Its Center Span, 385 Feet in the Clear, Places It among the Remarkable Bridges of the World. Its Total Length Is About 1,000 Feet, and Its Rise 120 Feet. Stairs at Each End of the Arch Lead to Public Comfort Stations

## CONCRETE BRIDGE IN OREGON TO HAVE REMARKABLE SPAN

A concrete highway bridge recently designed to cross the Willamette River in Oregon is remarkable not only for its graceful lines but for its exceptionally long span. The total length of the bridge will be about 1,000 ft., and the span will be 385 ft. clear, with a rise of 120 ft. Provision is made for public comfort stations below the ends of the main span, reached by stairways. Fabricated structural-steel rib work, incased in the big arch, is calculated to give it strength and rigidity, retaining the permanent and artistic qualities of concrete.

## BLAZING OIL TANKS FEATURE NEW YORK'S GREATEST FIRE

At 10:15 in the evening telephones jangled in a hundred fire stations throughout New York City, as headquarters transmitted for the first time in its history the signal which orders every fireman off duty to report at once. The great city's greatest fire had started at 2:00 p. m. that day, September 13, when flames leaped from a huge oil tank in a 20-acre refining plant in Brooklyn. One after another 36 of the monster cylinders had blown off their tops. From each now surged a mass of flame, sometimes a thousand feet high. Over the tanks, and spreading fast over surrounding tenements and factories, lowered a mushroom pall of greasy, slow-rolling smoke. From the creek which borders the refinery 12 fireboats pumped streams of water. Right in among the flame-boiling tanks labored firemen from half a hundred engine companies, their faces scorched, their feet blistered by the burning oil. Sight-seers by the tens of thousands united with half-crazed tenement dwellers to press against the fire lines. Thus burned New York's greatest fire all that night and the following morning, when it was finally brought under control. Not for several days, however, did the subsiding flames permit the inspection which revealed a property loss of $2,000,000 or more. A quarter of the loss, or $500,000, was in oil alone. The casualty report of 200 slightly injured seems miraculously light, however, to an observer who remembers the apparently reckless heroism of the police and the frequent panics that swayed the great crowds as they were repulsed by the hot breath of the flames.

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**This Telephone Lineman, Busy with Pliers and Cable, Though Only a Few Feet from a Smoking Tank, Was One of a Thousand Men Who Quietly Did Their Duty While New York City's Greatest Fire Burned with Volcanic Fury. On the Tank in the Foreground the Fire Fighters Trained a Dozen Streams in an Effort to Save It. The Tank in the Background has been Crumpled by the Flames**

**New York City Experienced Its Greatest Fire When 30 of These Great Oil Tanks Exploded and Belched Flame and Smoke for Several Days. Property Loss would have Been Appalling had It Not Been for the Heroism of the Fire Fighters. Pulling Their Lines Even Closer to the Red-Hot Tanks Than Shown Here, They Suffered Scorched Faces and Blistered Feet. As a Spectacle the Fire has, Perhaps, Never been Surpassed**



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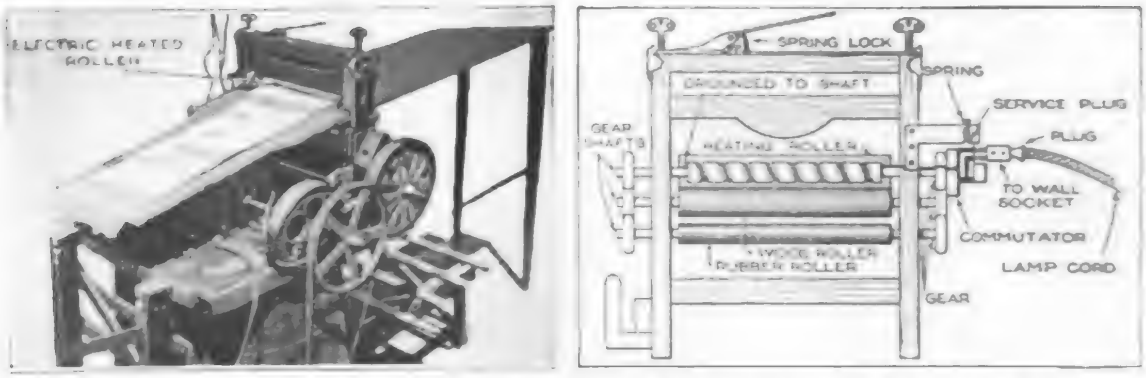


**Combination Clothes Wringer and Mangle: On the Left the Device is Attached to an Electric Washing Machine. Details of Construction are Shown on the Right**

## GOLF PRACTICE IS MADE SAFE BY BOUNCELESS BALL STOP

A golf ball driven, no matter how forcibly, against a loose canvas curtain, goes "dead" and falls harmlessly instead of slicing away, possibly to do damage. In a new device for golf practice and instruction, such a curtain, about 40 in. high and 30 in. wide, is mounted on a

**Canvas Backstop for Golf Practice: The Ball Falls "Dead" on Striking the Loose Canvas, the Paper Strip Marking the Accuracy of the Drive**

folding frame that leans slightly toward the player, and has canvas side wings further to confine the ball. A strip of paper, fed from a roll at the top, hangs down the center of the curtain, and serves as a target, to be perforated by an accurately driven ball. The contrivance can be used indoors if desired.

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¶ A wireless station five times the strength of the Eiffel Tower station, with a sending radius of 12,500 miles, or halfway around the world, is to be built at Croix-d'Hins, near Bordeaux, France. Its sending capacity will be 72,000 words a day.

## MANGLE FOR HOME LAUNDRY ATTACHES TO WRINGER

Electric washing machines have become common household utilities, and all the late models are equipped with power-driven wringers. By a simple attachment, a Nebraska inventor now supplies means for converting the wringer into an electrically heated mangle, capable of ironing a family washing in less than an hour. The attachment consists essentially of a steel roller containing a heating coil wound on porcelain, a wood roller, and a service plug. To assemble, the top of the wringer is removed, and the upper rubber roller taken out. The wood bearings are then reversed, and the wood and steel rollers inserted in order. The ironing roller stays hot long after the plug is withdrawn, and is claimed to require very little current.

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## PATH OVER WHITE MOUNTAINS BUILT BY FOREST SERVICE

Traversing some of the most beautiful country in the White Mountain National Forest, a 40-mile foot trail is being constructed by the Forest Service, and will be ready early next year. The new path will be the first extending from north to south through the government reservation. At frequent intervals along the route will be erected shelters for the use of travelers. A trip over the trail will require about a week. Several names have been suggested as suitable for the road, but as yet none has been selected. Two public camping grounds will be opened in the forest when the trail is completed. Spring water will be piped to these, and stone fireplaces built on them for the convenience of travelers, who will be allowed to use the sites without charge.

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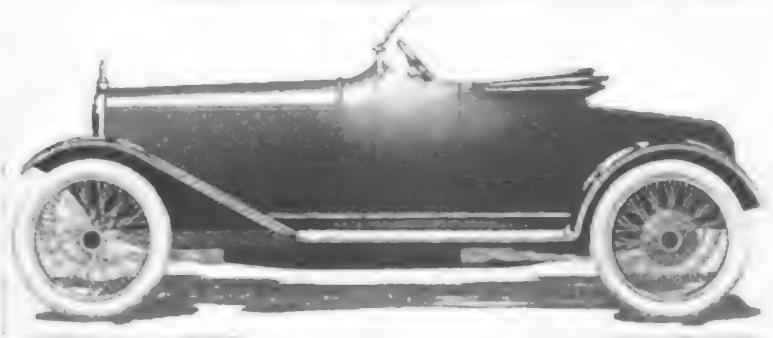
## MINIATURE AIR-COOLED CAR IS NEW ENGLISH MODEL

That the two-cylinder opposed engine for automobile propulsion will not stay in retirement is evidenced by the power plant of a miniature two-passenger car about to be placed on the market in England. The engine is air-cooled, and the gasoline tank occupies the usual place of the radiator water tank, using the same filler opening. The car is narrow-gauge, tracking only 45 in., though its wheel base is 96 in. The wheels are 28 by 3½ in. The car, fully equipped, weighs but 600 lb., of which the engine accounts for 72 lb. Because of this extremely light weight, a speed of 60 miles an hour can be attained with the 12 hp. available. Except in point of size, the little vehicle's appointments are practically standard. It has four speeds forward, and reverse.



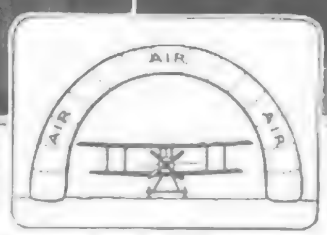
**High-Speed, Light-Weight Miniature Car Recently Designed in England, with a 12-Horsepower, Two-Cylinder Opposed Engine; The Wheel Base Is 96 Inches, the Tread 45 Inches, the Weight 600 Pounds, and it is Air-Cooled**

## AIRPLANE HANGAR INFLATED LIKE A FOOTBALL

The development of a satisfactory portable airplane hangar for field service is one of the necessities revealed to every air service by the late war. The need was glaringly apparent during the last great advances. The flimsy canvas structures then employed fell flat before a strong wind, and during a rainstorm usually held in pools the water not spilled on the planes within. Interest is therefore centering on a portable hangar of French conception and remarkable originality of design. Tent poles and guy wires are conspicuous by their absence. Waterproof, airtight fabric is the only material used. To erect the hangar it is tumbled out of an auto truck, spread flat on the ground, and connected by a hose to a motor-driven air pump. As the air

**Though Constructed of Thin Balloon Fabric, the Inflatable Airplane Hangar is Made So Rigid by the Injected Air That the Roof will Support a Man**

**This Interested Crowd Witnessed the First Public Demonstration of the Inflatable Hangar. The Strange Structure is Manufactured by a French Aircraft Firm**



**Motor-Driven Air Blowers Quickly Fill Double Walls of the Balloon Fabric. In the Center is Shown Diagrammatically the Double-Walled Construction of the Novel Hangar**

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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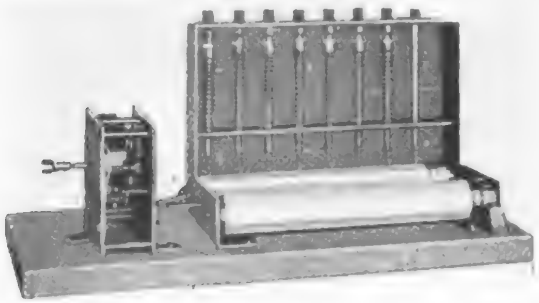
is forced between the double walls of balloon fabric the hangar grows, becomes rigid, and soon is seen as a dozen tubular arches placed side by side.

## AIRPLANE SHOCK RECORDER PROMISES NEW INSTRUMENT

An instrument which will indicate to the airplane pilot the stresses exerted at every moment on every part of his airplane is the logical development of a simple shock recorder now used by the U. S. Navy. The recorder at present consists of a number of vertical styluses held against gravity by coil springs of graded strength. Beneath the stylus points revolves a recording drum at constant speed. When an experimental flight is made, this apparatus is carried in the fuselage, where it records every shock encountered in flying and landing the plane; that is, a number of styluses descend and make their marks at every bump or shock, the intensity of the force overcoming in succession stronger and stronger springs. The proposed instrument, however, will be more complex. Individual recorders will act as electric contact makers in body, wings, and undercarriage. From each recorder wires will lead to the pilot's instrument board, where tiny electric bulbs will give him instant warning of dangerous stress and possible breakage. A tentative instrument of this kind has actually been used in the experiments of the navy experts.



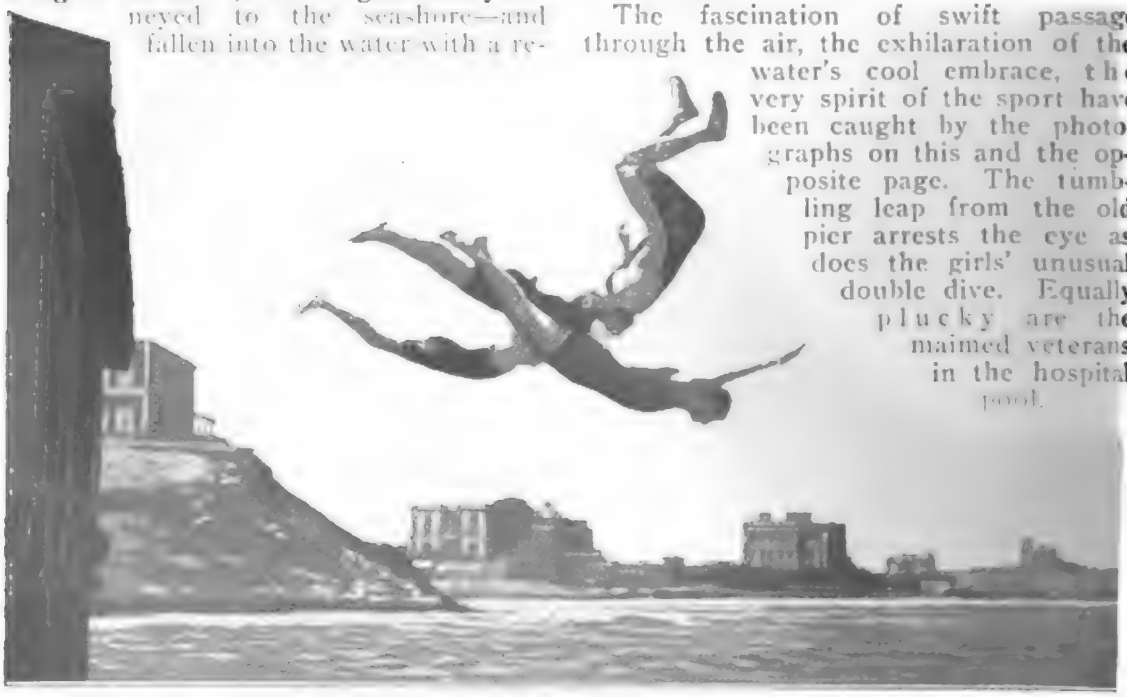
BY COURTESY OF THE JOURNAL OF THE FRANKLIN INSTITUTE

**From This Rudimentary Airplane Shock Recorder has been Developed an Experimental Instrument Which Informs the Pilot of the Comparative Stresses throughout His Machine**

## PHOTOGRAPHER SNAPS DIVERS IN THRILLING FEATS

The dictionary informs one that "to dive" he simply "plunges into water head foremost." It's easy to imagine how old Noah Webster, having thus settled the thing in his mind, then might have journeyed to the seashore—and fallen into the water with a resounding smack. In that way he would have learned to define diving as an art. For it requires practice, and like any art rewards its devotees with its own peculiar thrills.

The fascination of swift passage through the air, the exhilaration of the water's cool embrace, the very spirit of the sport have been caught by the photographs on this and the opposite page. The tumbling leap from the old pier arrests the eye as does the girls' unusual double dive. Equally plucky are the maimed veterans in the hospital pool.



**By Carefully Counting Feet, One Finds That Four Swimmers Posed for This Unusual Photograph. Three are Diving Straight for the Water, Many Feet Below. The Fourth is Adding the Dangerous Thrill of a Somersault**

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Caught as They Dive Together for a Friendly Tilt Are Six Soldier-Inmates of a Great Reconstruction Hospital in Washington, D. C. The First Two Have Only One Leg Apiece, the Third Makes His Way with One Arm. The Pool was Donated to the Hospital Because of Swimming's Recognized Value in Restoring Health and Muscular Poise

**The Girls are Here Showing the Boys a "Cooperative" Dive That Never Fails to Attract Attention. Each with an Arm about the Other, They have Jumped from the Platform to the Water, a Dozen Feet Below. The Stunt Requires More Daring Than Skill, So may Easily be Made the Basis of Friendly Competition by Members of a Swimming Party**



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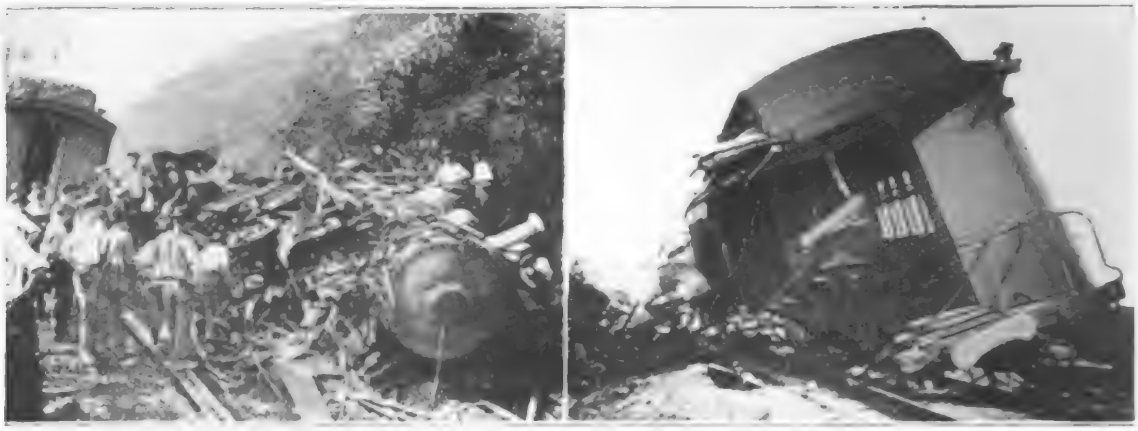

The Almost Unbelievable Disintegration of the First Wooden Coach is Seen by a Glance at the Rubbish-Hidden Locomotive on the Left. The Fate of the Second Coach was Different. Striking the Overturned Locomotive Less Squarely Than the First Coach, It Lost One Entire Side. Passengers and Seats were Scattered over the Right of Way. In the Photograph at the Right the Second Coach has been Restored to the Rails

## EXTERNAL BRACES EMPLOYED TO STRENGTHEN SHED

In order to dispense with obstructive cross timbers and vertical supports inside a large farm-implement shed, erected recently on a middle-western farm, a novel method of strengthening the building was employed. Inclined braces were placed at intervals along the sides of the structure, extending from the eaves to the ground. Over these were nailed clapboards, form-

Clapboard-Covered External Braces, When Used to Strengthen a Farm-Implement Shed, do Not Mar the Appearance of the Building

ing boxes which effectively concealed the unsightly props. The unusual braces render the building capable of standing through any ordinary windstorm.

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One and one-half million brass cartridge cases of various sizes have been placed on sale by the War Department at 20 per cent above the current value of the metal contained in them. Included are a number of artillery cases, suitable for making lamp bases, or other articles.

## RAILROAD WRECK SMASHES OLD COACHES TO KINDLING WOOD

A train of heavy steel passenger coaches would have come off with a few scratches and broken panes. Being of wood, however, the cars in a recent railroad wreck collapsed with a completeness almost unprecedented. As the engine left the rails and plowed into the right of way, it was followed by the two nearest coaches. The first of these, backed by the terrific momentum of the entire train, crashed upon the engine and crumpled like an eggshell. Wreckers likened it later to casual rubbish at a city dump. The next coach ripped itself open from end to end upon the recumbent engine, spilling out seats and passengers in wild confusion. Several persons were hurt, some mortally.

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## ILLNESS CAUSED BY GASES FROM FACTORY CHIMNEY

Gases resulting from combustion, particularly carbon monoxide, are responsible for many cases of illness among inside workers, according to medical authorities interested in the prevention of occupational diseases. In one case on record, 73 out of 125 persons employed on the three upper floors of a 12-story factory building were affected simultaneously by chimney gases which entered through a trapdoor on the roof, and reached the workrooms through a hallway at the end of the structure and the corridors on the different floors. The workers complained of dizziness, headache, and general weakness. Most of them recovered within a few hours.

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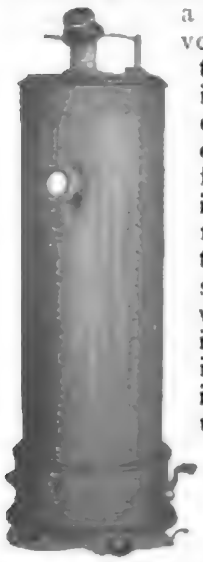
## RECOMMEND OIL TREATMENT FOR LEATHER ARTICLES

Applying oil or grease to shoes and other leather articles will greatly prolong their term of usefulness, according to government experts. Castor oil is recommended for dress shoes. This should be used sparingly, and thoroughly rubbed into the leather. If it is applied at night, the shoes can be polished the following morning. Tan shoes become slightly darker after this treatment. When it is not desired to polish shoes, neat's-foot oil, fish oil, and tallow, vaseline, or petrolatum are suitable. These should be warmed before their application, though the temperature should not be high enough to be uncomfortable to the hand. Before shoes are oiled or greased they should be carefully cleaned, in all cases. Harness should be washed frequently in tepid water with a neutral soap, and oiled before it has dried. Excess oil should be removed with a cloth. This keeps the leather pliable.

## DENTAL X-RAY MACHINE HAS SPECIAL TUBE IN CABINET

Making dental X-ray photographs is becoming almost as simple as operating a camera. A recently developed machine has its tube, transformer and all, inclosed in a cylindrical cabinet, only 20 in. in diameter and less than five feet high. The patient sits in an ordinary chair and rests his head against the adjustable, funnellike shield of the exposure window, the operator making the exposure by pressing a foot lever. The tube is of special construction, using a very small current and remaining cool even after repeated use. It is almost wholly inclosed in a thick lead sheath to prevent any possibility of burns. No special training is necessary to operate the device.



## AUTOMATIC DOUGHNUT CUTTER BUILT FOR USE AT FAIRS

The hand-forged doughnut will continue to have its devotees, but for large output at carnivals and fairs a new automatic cutter has undoubted advantages. The machine is set up in a booth or show window with a stove and large pan of cooking grease underneath. The hopper is then filled with dough, the crank is turned, and the dough is forced into a vertical reservoir formed of an outer and inner cylinder. Issuing from this reservoir as a continuous "pipe" of dough, it is sliced by a reciprocating horizontal knife into individual doughnuts. These fall into the hot grease, whence they are lifted when brown, sprinkled with sugar, and sold to the ultimate consumer.

The Doughnut Cutter is Attached to a Post or Wall by This Long, Hinged Arm, Which Holds It over the Cooker

As the Operator Turns the Crank of the Doughnut Cutter a Horizontal Knife Blade Speeds Back and Forth beneath the Dough Reservoir. For Every Trip of the Blade a Raw Doughnut Drops into the Cooking Grease in the Pan Below

¶Two automatic-telephone exchanges about to be installed in Copenhagen, Denmark, will be fitted with American equipment, purchased from a manufacturer here. The exchanges are to have a 10,000-subscriber capacity and will cost over one million dollars.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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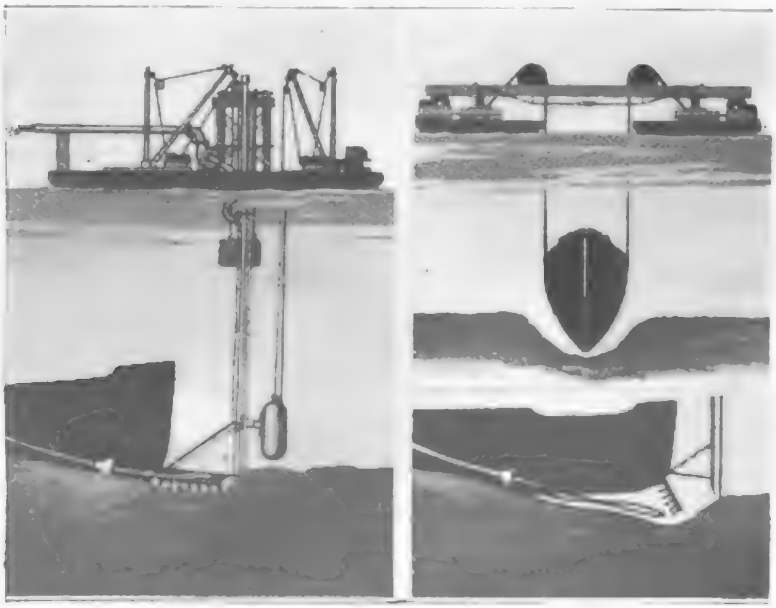
# POST-WAR SALVAGE PROBLEM DEVELOPS NEW DEVICES

By HAROLD W. NORFOLK

SCATTERED over the bottom of the ocean is a vast fortune in ships and cargoes, sent down by mines, submarines, and other instruments of naval warfare during more than four years of international strife. Now that hostilities have come to an end, serious attention is being given to the problem of raising these submerged wrecks, salvaging their sometimes valuable contents, where the damage by water has not been too great, and putting the vessels back into commission. Contrary to popular belief, many of the sunken craft can be brought to the surface and restored to serviceable condition with the expenditure of only a small amount of time and money. Myriad inventions have been offered to assist in floating the lost fleets. Some are absurd, but among the collection are numerous devices of practical value. Many of the latter, no doubt, will be adopted by the salvaging companies which are planning to retrieve the now worthless tonnage.

One accepted method of reclaiming sunken ships is by means of pontoons. These are attached to cables or chains passed under the hull, which is pulled from its resting place by the buoyancy of the floats, and eventually brought to the surface. The chief difficulty encountered in this work is in placing the cables. In cases where the vessel has settled a considerable distance into the sand, the operation requires much time and labor. Ingenious machines for digging under the wrecks and carrying cables through the tunnels thus formed have been developed, and are expected to expedite salvaging to a great extent. One device of this type resembles the armored tanks that played such an important part on the battle fields of Europe. Endless treads on either side of the burrower carry it forward in a path sluiced by a powerful stream of water. Power is obtained from a small hydraulic turbine, contained within the contrivance, and supplied with water under high pressure by pumps carried on a lighter which is anchored over the wreck. A diver guides the machine, which is declared to be capable of tunneling under a hull in a surprisingly short time. Another



In the Diagram at the Left the Rotary Rake is Shown Undermining the Prow of a Sunken Ship. The Method Employed in Raising the Vessel is Illustrated on the Right

Modeled Like a Fighting Tank, This Burrowing Machine, Guided by a Diver, Crawls underneath a Hull, Dragging a Cable through the Resultant Tunnel



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**Inflatable Pontoons Supporting a Vessel: These Balloonlike Floats Consist of an Inner Case of Rubber Covered with Canvas and Rope Netting. Attached as Shown in the Picture and Filled with Air, They Quickly Bring a Submerged Wreck to the Surface**

somewhat similar device comprises two revolving screws, actuated by a hydraulic turbine. It is designed for use on soft bottoms.

Different in principle is a third apparatus, the most important part of which is a large rotary rake for digging under the prow or stern of a sunken vessel so that pontoon cables can be slipped under the hull from one or both ends. The rake is fastened near the end of a pointed steel pile, which is used to moor a lighter over the scene of operations, and is revolved first in one direction and then the other by a cable, which runs in a groove around the edge of a circular base that holds the sharpened teeth. The ends of the cable are attached to two tugs, which steam alternately toward and from the wreck. A suction pump removes material loosened by the rake. This curious apparatus is directed from a submarine cage, large enough to hold a man, which is suspended in a convenient position. A powerful searchlight on the cage illuminates the rake and its surroundings.

**Preparing to Resurrect a Submerged Ship: Deflated Pontoons are Lowered from the Lighter and Fastened to the Lifting Cables by a Diver**

Inflatable pontoons are another recent contribution to salvaging equipment. These are shaped somewhat like balloons, and include inner cases of rubber covered with heavy canvas, and further protected by a rope net. When deflated, the bags can be submerged and fastened to the ends of lifting cables. Filled with air, their buoyancy brings the wreck to the surface. Each pontoon is fitted with two valves, one for admitting air, and the other for releasing it.

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## WINDMILL ON VERTICAL AXLE REQUIRES NO TOWER

A towerless windmill, which is practically supported in the air by its own vertical shaft, is the invention of a Kansas farmer, who uses it for pumping, grinding, and to generate electric current. The windmill itself is vertical,

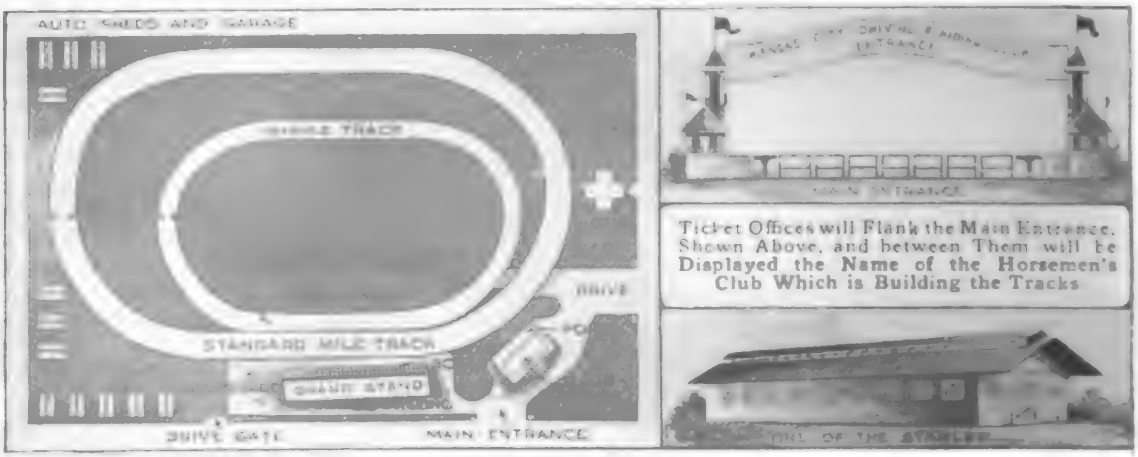
Towerless Windmill: Extended, the Sections are Rotated by Air Currents on a Vertical Shaft. The Insert Shows Them Closed

consisting of four sections of a metal cylinder mounted directly on the shaft, which runs in an open framework held upright by guy wires. When the vanes are closed and form a complete cylinder the mill is stationary, but when turned by a lever so the edges project and catch the wind, the shaft is rotated and transmits its power by pulley and belt. To keep the speed constant, an automatic governor operates on the inner edges of the vanes.

## NOVEL RACE-TRACK PROJECT FOR KANSAS CITY

A novel race-track construction plan has been approved by a horsemen's club of Kansas City, Mo., and work on the project will begin in the near future. Two elliptical dirt courses will be built, one within the other, the larger one mile in circumference, and the smaller half that distance around. The former will be 90 ft. wide, and the latter 60 ft. Motor cars will be parked within and on the shorter track when the one-mile course is in use.

Improvement of the ground surrounding the tracks will be accomplished by the erection of a large hotel, intended for the use of visiting turfmen; a modern clubhouse and a grand stand, the latter 400 ft. long and capable of seating thousands of spectators. Eight stables, each providing quarters for 20 horses, will be built, besides four sheds for automobiles. A cinder path from the stables to the tracks will make it possible for trainers to exercise their animals when the tracks are in a muddy condition. It is estimated that more than $160,000 will be required to carry out the plan. Two entrances will be provided, one for pedestrians and the other for vehicles. There is now no race track within convenient distance of the city. Meets have been held in a playground.




Kansas City Race Tracks: In the Plot at the Left can be Seen the Arrangement of the Grounds. The Stables, One of Which is Pictured on the Right, will House 20 Horses Each

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# MARATHON CANOEIST MAKES DARING TRIP

By L. W. PEDROSE

WHAT is said to be the first trip over the route ever made by a white man in a canoe and alone, was accomplished by a former officer in the A. E. F., recently discharged from the service, when he rowed his frail boat from Seattle to Skagway, 1,600 miles, in 80 days, including 28 days spent on side trips and in camp along the route. He carried with him only his camping outfit, a gun, and a typewriter. His adventures included hobnobbing with fishtrap pirates; camping with Alaska Indians, who believed his use of the typewriter was black magic and bad medicine; a close escape from death at Stickine Glacier, and detention once on a charge of murder. He lost five pounds in weight on the voyage, but the only sickness he suffered was a cold, which he believes he contracted while sleeping between sheets in his stateroom on a steamer while homeward bound.

The trip was continually stormy, and the hardy canoeist was wet through to the skin most of the time. His breakfast, as a rule, consisted of two pancakes, two slices of bacon, and thirteen prunes. He laid the prunes along the deck of the boat and munched them as he rowed. For other meals, he varied the diet with fish that he caught, and small portions of meat and vegetables from a precious little stock of canned goods.

While visiting the Indian town of China Hat, near Bella Bella, the wayfarer was entertained by the Indians and treated with the utmost courtesy. Two weeks later he arrived at Lowe Inlet and learned how close a call he had had with death. The night he had stopped at China Hat, an Indian woman and her daughter had been found dead, and he was suspected of killing them with the black magic of his typewriter to obtain $500 which they were believed to possess. The Indians, although apparently friendly, were preparing to make away with him when he departed. Only the fact that he was a white man preyented them from following him and seeking vengeance. At Lowe Inlet he was closely questioned by the magistrate and would have been put in jail had not a cannery tender arrived with the intelligence that the Indian woman and her daughter had been drowned.

At Juneau, the canoeist met Governor Thomas Riggs, who had heard of his trip and came down to the docks to meet him.

At Wrangel, the voyageur purchased a tiny white Malemute pup, which accompanied him the remaining 400 miles of the trip. The dog was with him when he made a landing on the Stickine River, climbed Muir Glacier and lost his way. Caught in a pocket between two 80-ft. walls of ice, he remembered reading of travelers who had cut steps in the face of the ice and climbed out. He whittled with his knife till his hands became numb, but found that hewing ice with a knife was only fiction. He finally managed to wriggle his way to freedom through a hole in the glacier.

The marathon canoeist plans next to visit the interior of Japan. Then will come South America, where he plans to ascend the Amazon River, from its mouth to one of its tributaries in the Andes.



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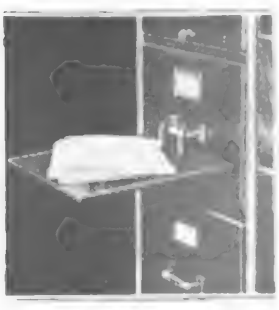
## TRANSFER RAILROAD TRACK WITH LOCOMOTIVE CRANE

Considerable time and labor were saved on an Ohio railroad recently by utilizing a locomotive crane for transferring a short stretch of track from one location to another. The track was divided by uncoupling the rails, and each section thus formed was lifted by the machine and transported, with the ties attached to the rails, to the new roadbed, where it was lowered into place and quickly made ready for service. Ordinarily such work is done by removing the rails from the ties and moving the two separately.

Locomotive Crane Transferring a Railroad Track: Sections Such as That Shown in the Picture were Lifted from an Old Roadbed and Placed in a New Location by the Powerful Machine

## SHELF FOR FILING CABINET HANGS ON DRAWER HANDLE

A new convenience for the filing clerk has made its appearance on the market. The device is an oak shelf, 12 in. square, equipped with two metal hooks which permit its attachment to the handle of a filing-cabinet drawer. Papers can be laid on the shelf, leaving the hands of the clerk free to insert the documents in their proper places. To prevent damage to the cabinet, the hook ends are rounded.



## STEAMSHIP PROPELLER SHAFTS TURN ON WOODEN BEARINGS

While inspecting the head of a golf club or fitting a caster to the dining-room table, few landsmen realize that they are handling wood from the West Indian guaiacum, or lignum-vitæ tree. Fewer realize that this same wood has been used to make propeller-shaft bearings for every battleship and ocean liner on the high seas. This wood, alone of the thousands upon the earth, will survive the grinding rotation of the great shafts. The reason is found on examining a lignum-vitæ log. The sap cells are seen to be full of heavy, solidified resin. Successive layers of fiber are arranged obliquely to each other, making it impossible to split the log. Fibers cross and recross until the log is bound into one close-knit mass.

## DEAD FISH BELIEVED KILLED BY MYSTERIOUS MOSS

Western fishermen would like to know what mysterious agency is responsible for the death of the fish in Klamath Lake, which lies in southern Oregon at the foot of the Cascade Mountains. Thousands of beautiful trout have recently floated to the surface, dead, yet showing not a sign of violence or disease. Many sportsmen, thinking of Crater Lake, only 30 miles to the north, declare that a volcanic disturbance is to blame. But a few others support a different theory. They point to the water of the lake, once clear as crystal, now muddied everywhere by particles of brown moss. They believe that some subterranean inlet has vomited great masses of the moss into the lake, enveloping and smothering the fish.

¶ Paris finds that the military motor trucks which rumbled endlessly through her streets during the days of war have left other marks than torn and rutted pavements. Monuments, old houses, and many palaces have been injured by the jarring vibrations of the unusual traffic.

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# GERMANY ADDS AIR LINER TO COMMERCIAL FLEET

The Hamburg-American Air Liner "Bodensee" Recently Carried 40 Passengers on Its Maiden Flight of 375 Miles from Friedrichshafen to Berlin. Hot Meals were Served during the Uneventful Six-Hour Journey

One of the Crew Stands at the "Bodensee's" Elevator Controls, Located with the Other Navigating Apparatus in the Forward Part of the Passenger Cabin. It Is with the "Bodensee" and Similar Airships That Germany Plans to Establish Air Routes to Athens, Lisbon, and Eventually to New York City. This Last Service may be Inaugurated within a Year

The Commercial Air Liner "Bodensee" is Here Shown in Its Hangar at Friedrichshafen. Though Only 325 Feet Long, the "Bodensee" Makes More than 60 Miles an Hour and Is the Last Word in Airship Construction. In Contrast to the Monster Naval Zeppelins of 1918, Driven by Six Power Gondolas, the "Bodensee" Carries Only Two

Officers of the "Bodensee" are Shown in the Chart Room during the Maiden Voyage to Berlin. Officers and Crew Have Their Quarters in the Internal Keel



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## SOLDIER RECEIVES LETTER EIGHT MONTHS ON WAY

Stamped and scribbled on a battered envelope owned by a veteran of the great war is a veritable Odyssey of wandering

**On His Return from Overseas a Veteran of the Great War Received This Letter. For Eight Months It had Followed Him to Hospitals and Casual Camps, Arriving at Every Station to Find Him Gone**

and adventure. The letter was written by a friend in the United States and was intended to reach the soldier in France, but arrived "just too late." It missed him again and again at hospitals and casual camps. Opened once by mistake, it was given a wound stripe; another humorous mail clerk awarded it a stripe for six months' service overseas. Eight months after mailing, the letter reached the addressee, now back home.

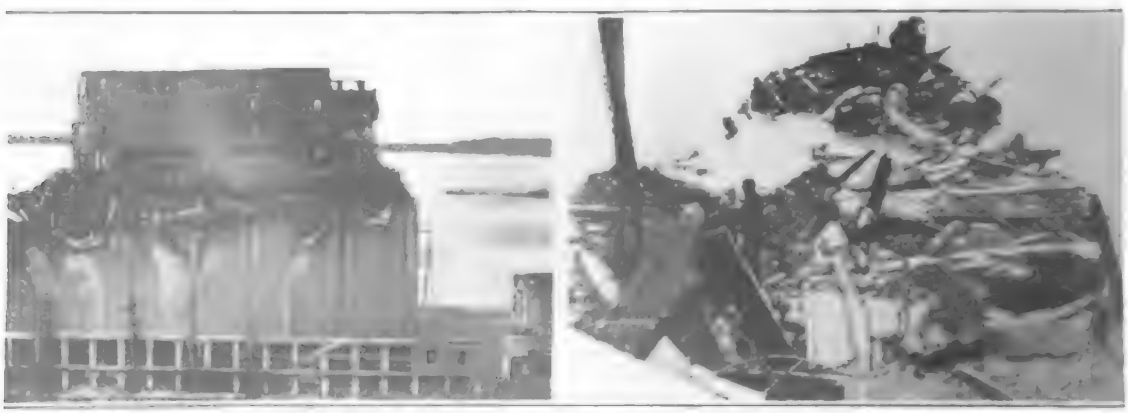
¶To the war trophies now exhibited by the Smithsonian Institution at Washington, D. C., will soon be added the field kitchen which followed the former German kaiser on his trips behind the battle lines. It is noteworthy that the kitchen shows no sign of damage.

## FISH LIVE LONG AS CAPTIVES, AQUARIUM RECORDS SHOW

That captive fish, properly fed and cared for, may live a good many years in apparent contentment, is indicated by the records of the New York Aquarium. A pair of gar pike win the longevity contest with more than 20 years apiece, closely pursued by a channel bass with 19 years. A bowfin, better known as a fresh-water dogfish, was a tenant for 18 years. Extremely active and wide-ranging fish, like mackerel and herring, on the other hand, connot be kept alive very long. Many fish die from apparently insignificant injuries inflicted in their capture.

## CONCRETE ELEVATOR EXPLODES AND WRECKS STEAMER

Despite its reinforced-concrete construction, a huge grain elevator at Port Colborne, Ontario, exploded a short time ago, wrecking its workhouse, killing eight persons, and injuring many more. Grain dust is assumed to have caused the explosion, which threw a column of dust and smoke a thousand feet into the air. The roof was blown some 200 ft. high, and portions of it were later found a mile away. A peculiar feature of the accident was the wrecking of the barge "Quebec," moored at the elevator, by a descending mass of débris. The steamer was saved by towing it onto the beach before it could sink. The big concrete structure, which cost $2,000,000 eight years ago, had a capacity of 2,000,000 bu. of grain, but was only about one-third full at the time. Grain was scattered far from the scene of the explosion, while the heavy walls of the structure were torn as though by a blast of powder.



**A General View of the Wrecked Elevator can be Seen on the Left, While on the Right is Pictured the Barge "Quebec," Damaged by Falling Debris. Grain Dust is Assumed to have Caused the Explosion**

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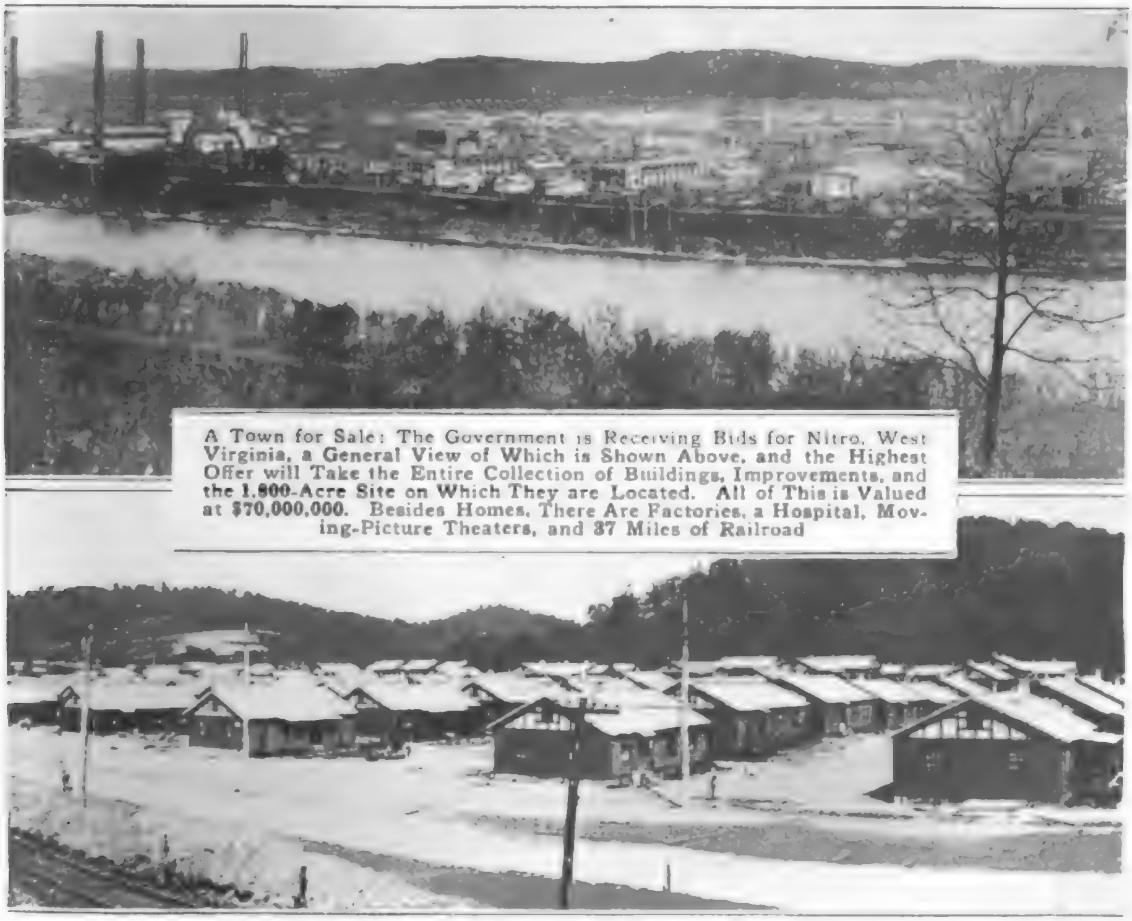

A Town for Sale: The Government is Receiving Bids for Nitro, West Virginia, a General View of Which is Shown Above, and the Highest Offer will Take the Entire Collection of Buildings, Improvements, and the 1,800-Acre Site on Which They are Located. All of This is Valued at $70,000,000. Besides Homes, There Are Factories, a Hospital, Moving-Picture Theaters, and 37 Miles of Railroad

A Few of the 1,500 Workingmen's Cottages: During the War, These Sheltered Munitions Workers, but Now That Peace has Come, They Are Vacant. They were Erected by a Large Powder Company, and Later Taken over by the Ordnance Department

## OFFER WHOLE CITY FOR SALE; COST SEVENTY MILLIONS

An entire city, with all modern facilities for the housing, employment, education, and entertainment of a population of 20,000, is about to be knocked down to the highest bidder. The town, Nitro, W. Va., is situated 17 miles from Charleston, on the Kanawha River, and has an excellent water and sewer system. It was built by a big powder manufacturer, at a cost of $70,000,000, to produce war munitions, but was later taken over by the government. It contains 1,500 houses for workmen, 75 residences suitable for executives, 737 factory buildings, a 24-room school, a 400-room hospital, and picture theaters; in fact, all the customary appurtenances of an up-to-date municipality, including 37 miles of railroad. The site covers 1,800 acres and is in the foothills of the Appalachian Mountains, which are visible on clear days. Included in the railroad equipment are a number of steam and electric locomotives.

## AIRSHIP'S FABRIC LIFEBOATS INFLATED FROM BALLONETS

Running from bow to stern of every British rigid airship is a triangular-shaped corridor, or keel, which stiffens the hull structure and provides means of communication between various parts of

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An Airship Being Unavailable, These Members of the Air Force are Demonstrating the Inflation of the Lifeboats Carried on the Great British Airships. Gas from the Ballonets Ordinarily Does the Job

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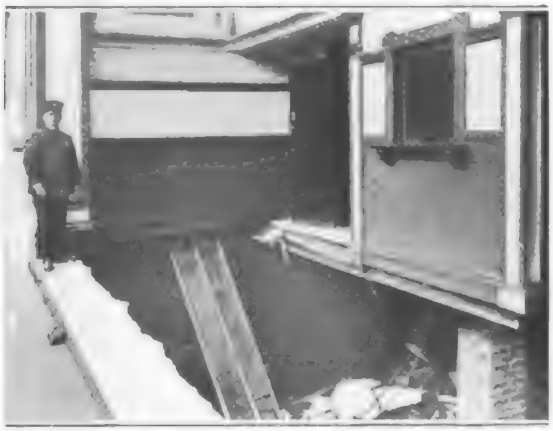
the ship. On the sides of the corridor, hanging from special girders, are all the accessories, such as gasoline tanks, water-ballast bags, and parachutes. And now is added the inflatable lifeboat. In case of forced descent upon the water the lifeboats, filled with gas from the ballonets, are capable of carrying six persons.

## ENTRANCE FLOOR COLLAPSES WITH THEATER CROWD

In the recessed entrance way of a Cincinnati picture theater, some days ago, 54 persons stood waiting for the second



The Gaping Pit into Which 54 Persons were Precipitated by the Collapse of the Theater-Entrance Floor: The Decayed Condition of the Wood Supports may be Seen

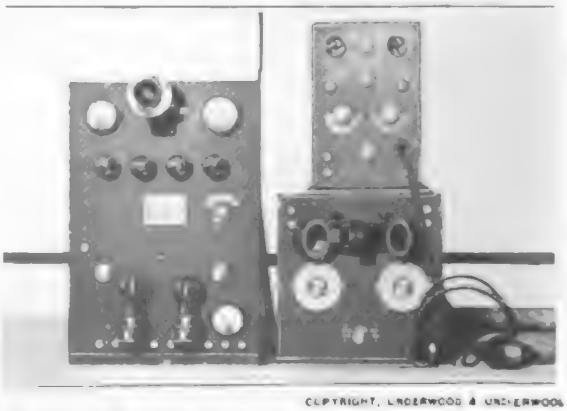
show and the signal to vacant seats. A moment later they had disappeared from view, and 15 ft. below a struggling mass of humanity trampled in panic frenzy. The tiled floor had given way under its four-ton load, and examination revealed that the wooden supports had rotted out at their end fastenings in the masonry. Some 30 persons were severely injured by the collapse, a contributing cause of which, in the opinion of local authorities, was the seepage of water from the scrubbing of the tile, decaying the wood.

## AIRMEN LOST FOR MANY DAYS ON LONELY AFRICAN COAST

Rivaling Hawker's disappearance in mid-Atlantic was the fate that recently overtook a party of eight Frenchmen en route from Paris to Dakar in French West Africa. Rising from Paris in the early morning, aboard a large bimotored airplane, they flew southward over France, Spain, and the Straits of Gibraltar, reaching Casablanca, Morocco, on the same day. Several days later the party flew southward again, after having equipped themselves with machine guns, rifles, and revolvers for possible use against the savage tribesmen who might be encountered on the final leg of 1,500 miles. Friends at Casablanca next heard of them as leaving Mogador, 200 miles down the coast, after a forced landing. Then came days of silence, which convinced all that the eight airmen had met death in some lonely spot. After a week's anxiety, however, a message came through from a deserted village, reporting the party safe but unable to proceed because of a broken propeller. With the subsequent announcement that the plane will there be dismantled it becomes evident that the French have once more failed to make the coveted flight. Dakar will be recalled as the African terminus of the proposed Paris-Dakar Railway.

## SMALL RADIO-TELEPHONE SET PLUGS INTO LAMP SOCKET

The development of a small wireless telephone outfit, just announced, that will operate on alternating current, is of greater significance than might appear at first thought, because the vast majority of lighting circuits are "a.c." Such a set therefore may be plugged into a lamp socket, needing no other source of power. In the outfit, as prepared for the market, all the equipment is mounted on a 20 by 14-in. panel, and on a small baseboard, weighing complete less than 50 lb. The telephonic transmitting range is 10 to 20 miles, two or four oscillator bulbs being used with two rectifier bulbs. The



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Complete Radio-Telephone and Telegraph Set Which Uses Alternating Current, and for Operation is Plugged into a Lamp Socket: Transmitting Equipment at the Left and Receiving at the Right

change from transmitting to receiving is made with a push button and relay. The telegraphic range is as much as 100 miles.

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ENORMOUS DRY DOCK DEDICATED IN THE HAWAIIAN ISLANDS

SINCE the completion of a mammoth concrete dry dock at Pearl Harbor, Island of Oahu, the Hawaiian group has become the chief rendezvous of the Pacific fleet. When the great structure was dedicated recently, a holiday was declared on the island, and most of the population of Honolulu, six miles away, journeyed to the site to witness the ceremonies, which included an address by Secretary of the Navy Josephus Daniels. Mrs. Daniels had the honor of pressing a button which opened the flooding valves. As the water rushed into the huge basin, a mighty cheer went up from the throng which lined its sides. The dock is one of the largest in the world, and is commodious enough to care for the biggest dreadnaught afloat. It is 1,001 ft. long, 114 ft. wide at the bottom, and 138 ft. across at the top. The Navy Department had charge of its construction.

## AIRPLANE SERVES AS HEARSE IN FIRST AERIAL FUNERAL

Following close upon the suggestion made in Popular Mechanics Magazine for October comes the announcement that an airplane has now been used as a hearse, and exactly as described. The occasion was the funeral of a child in Toronto, Canada. The little coffin was placed in the observer's cockpit of a biplace machine. Rising from the scene of the service, the plane quickly reached the place of interment, three miles away, while parents and friends followed more slowly on the ground. This is believed to have been the first funeral of its kind in America, and probably on either side of the Atlantic. With the precedent established others may be expected to follow.

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The First of Its Kind in America, and Probably in the World, Was This Airplane Funeral, Recently Conducted in Toronto, Canada

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## PONTOON EQUIPMENT CHANGES AIRPLANE TO SEAPLANE

Combinations of wheels and floats to permit airplane landings on either land or water have usually been found more cumbersome than useful. As a successful compromise solution of the problem, however, a Canadian boat maker is now producing interchangeable pontoon equipment for the well-known Canadian training plane. To effect the transformation from landplane to seaplane the landing gear is removed and the pontoons bolted to the regular undercarriage fittings. At the hangar, the operation is easily performed in an hour. The auxiliary equipment is expected to find much favor in the forest-lake regions, where landing fields are few.

**In Less Than an Hour This Airplane was Stripped of Its Undercarriage and Fitted with the New Pontoon Equipment for Flight over the Water. Speed is Not Materially Affected**

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¶The slate waste of north Wales is to be utilized by a company of recent incorporation by turning it into asphalt, bricks, abrasive soap, glass, and linoleum.

## MEASURE POWER OF LIGHTNING WITH IMPROVED APPARATUS

That the difference of potential resulting in a lightning discharge may reach the tremendous figure of 1,000,000,000 volts, and that this charge is distributed over a sphere some 2,000 to 2,600 ft. in diameter, is the conclusion derived from studies made with recently improved instruments in an English university. It is computed that a single discharge may dissipate as much as 1,000 kw. of energy. The new instruments include means for making a photographic record of electrometer readings, thus visualizing potential changes whose duration is less than one-tenth of a second. The results of the studies have encouraged a theory holding that processes like those which prevail in thunderstorms on earth are responsible for the emission of certain radiations from the sun.

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## CHANCE TO LEARN OPERATIONS OF SIGNAL CORPS OFFERED

Radio operators and telephone and telegraph men are in such great demand just now in the U. S. Signal Corps that an interesting opportunity is created for those inclined toward a technical career, with a taste for army life. Grammar-school graduates with an aptitude for electrical subjects, who succeed in meeting the other requirements, will be trained in the work of the corps, the supply of experienced men having proved inadequate.

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## POPULAR IDEA OF COAL MINING CORRECTED

The popular conception of coal mining as being confined to the ends of narrow tunnels is corrected by an artist's recent study of a large English mine. It is shown that the actual mining is done on a broad front of coal and rock, the tunnels being merely communication highways. The terrific pressure of the heavy limestone stratum above is utilized to open up the coal seams and aid the work of flaking off the coal. To keep this pressure within bounds, "packs" of stone are built, 12 ft. wide and 24 ft. apart. When the roof props are taken away, the huge mass of rock slowly comes to rest on the packs, and the miners hurry to load the coal before it is crushed by the tremendous weight upon it.

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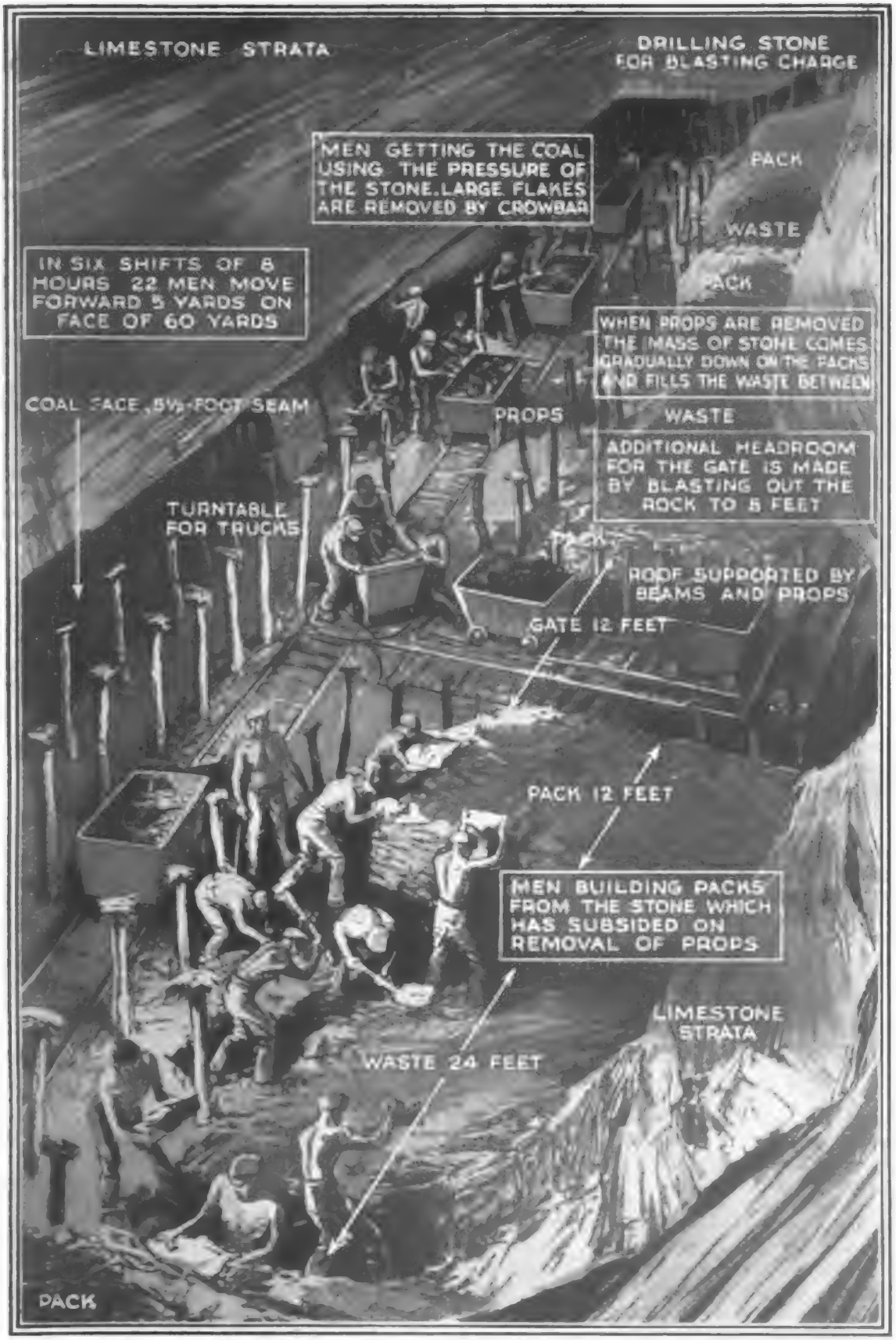


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**Artist's Study of a Coal Mine That Rectifies a Popular Misconception of Mining Methods: It is Shown That the Coal is Mined on a Broad Front, Instead of at the Ends of Tunnels, and That the Weight of Limestone Above is Used to Crush Out the Coal**



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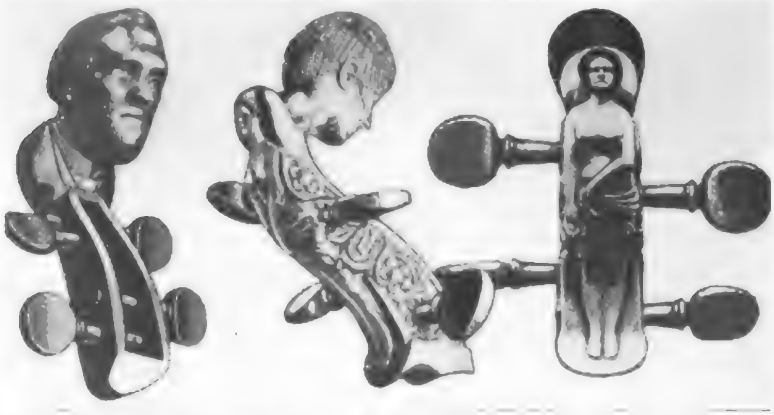
## REMARKABLE VIOLINS MADE FROM UNUSUAL WOODS

Materials of strange description contribute interest to the productions of an eccentric Ohio violin maker whose instruments are noted for their ornate carvings. Extremely simple tools are used by the workman, an old pocketknife with nicked and rusted blades being one of his favorite implements. In spite of this, the instruments have an excellent appearance and good tonal qualities. Wood taken from the heart of a partly petrified log, dug up in an eastern state, forms the back of one of the extraordinary violins. The log is declared to have been buried during the glacial period, and of course was centuries old when unearthed. Another unusual instrument has a back made from one of the drawers of a bureau brought to this country from England shortly after the historic voyage of the "Mayflower." Other pieces of antique furniture have furnished material for his violins.



These Remarkable, Carved Violin Peg Boxes were Fashioned with an Old Pocketknife by a Man Whose Hobby Is to Make the Instruments from Unusual Materials, Including Wood Taken from Antique Furniture, and the Heart of a Partially Petrified Log

## CHRONOMETER WINS CONTEST BY RECORD PRECISION

A chronometer which showed a variation from day to day of only six one-hundredths of a second won the world's record at the Geneva (Switzerland) Conservatory's latest annual contest. The method of scoring is by points, 300 being allowed for daily precision, 300 for immunity to temperature changes, 300 for resistance to the effects of changing position, and 100 for quick return to precision after such changes. In the contest 111 watch chronometers were entered, and five ship's chronometers.

## PROCESS IMPARTS HARDWOOD SURFACE TO SOFT WOODS

A surface treatment for soft woods has been developed that not only imitates the appearance of hard wood but toughens it, and enables it to take a high polish, causing the treated surface to exhibit the actual properties of the denser substance. It is evident that the body of the treated board, being still soft, can be worked much more easily than a homogeneous piece of hard wood. To impart the hardwood finish, a great number of cuts, about a twelfth of an inch deep, are made in the direction of the fiber and in arrangement like the surface pores of the hard wood. Into this mutilated surface is then rubbed a paste composed of an oil, a mineral substance, and a coloring material. This paste hardens in the artificial pores, forming a "mosaic" which has the properties described.

## GREENHOUSE-GLAZING DEVICE RESEMBLES GREASE GUN

Plastic glazing compounds are so generally used for waterproofing greenhouse roofs, instead of putty, that devices for applying these preparations are natural developments. Perhaps one of the most ingenious is a contrivance which resembles a grease gun, and is designed to be manipulated with one hand. It is strapped to the forearm and operated by pressing a lever on the cylindrical container. This forces a stream of cement from a spout. Guiding the latter around a sash quickly seals a pane of glass in place. Glazing compounds are declared to be more durable than putty.

¶The performance of a freight steamer in carrying 15,316 tons of coal from Toledo, Ohio, to Gary, Ind., a few weeks ago, is hailed as establishing a new record in coal cargoes on the Great Lakes.

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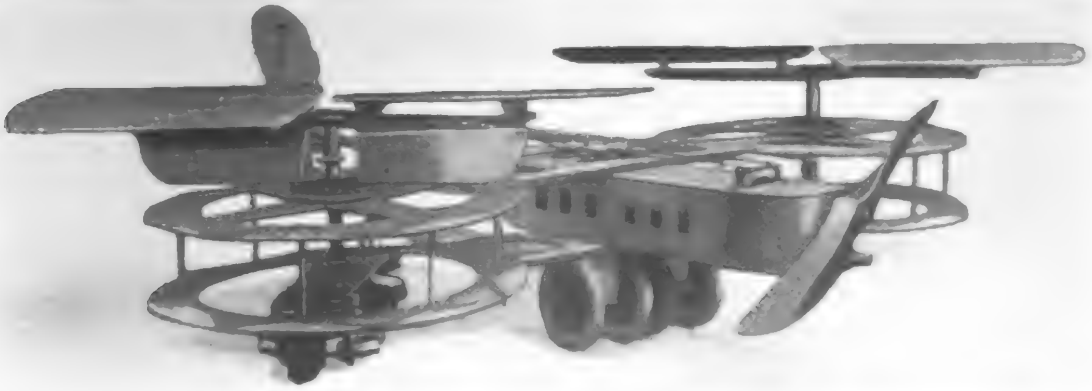
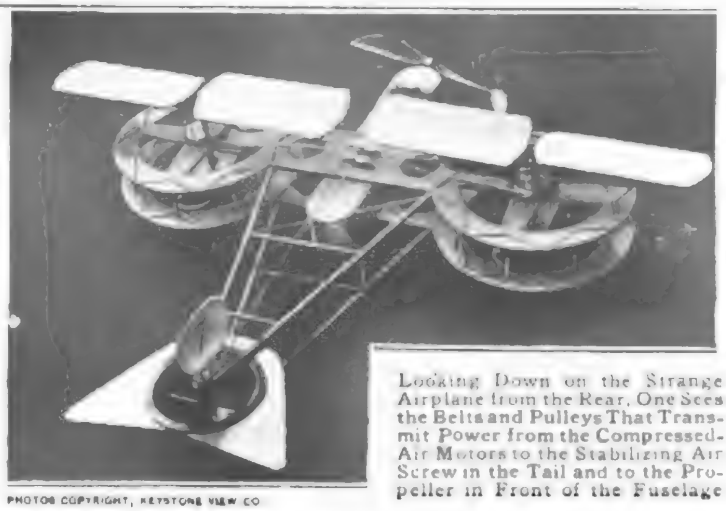
# WHIRLING POWER PLANTS LIFT NEW HELICOPTER



This Front View of the Revolutionary Vertical-Rising Airplane Shows the Compressed-Air Motors Which Race around the Circular Tracks



PHOTOS COPYRIGHT, KEYSTONE VIEW CO

Looking Down on the Strange Airplane from the Rear, One Sees the Belts and Pulleys That Transmit Power from the Compressed-Air Motors to the Stabilizing Air Screw in the Tail and to the Propeller in Front of the Fuselage

Before a well-known aeronautical society was recently demonstrated the model of a new helicopter, or vertical-rising airplane, which embodies several noteworthy departures in design. Speaking broadly, the machine is built on the lines of a conventional airplane. From the extremities of both wings, however, rise vertical shafts on which revolve the fanlike lifting surfaces, or air screws. A horizontal beam is fixed to the base of each of the two shafts. Attached to each extremity of these two beams is a motor which drives a traction wheel around a circular track. Each air screw revolves as the motors urge the wheels in whirling flight around the track. Thus the lifting screws are revolved with a power that could never be developed were they mounted directly on the engine crankshafts. In addition to turning the two major lifting surfaces, the whirling power plants transmit their power through belts and pulleys to a stabilizing air screw in the tail, and to a tractor propeller on the fuselage for forward motion.

The demonstration of this odd machine has reawakened interest in the whole problem of vertical-rising airplanes. The advantages of such a craft, if ever successfully realized, will admittedly be tremendous. It will be able to rise from and land on the most circumscribed areas. It will be able to drift with the wind, and in time of war will hover motionless over an enemy target while bombs are dropped by it with deadly accuracy.

## FINLAND PLANS SHIP CANAL BETWEEN LAKE AND GULF

Finland's new government is planning to make Lake Ladoga, situated between that country and Russia, accessible to large seagoing vessels. This will be accomplished by the construction of a canal which will connect the lake with the Gulf of Finland. The waterway will make it possible for ships plying the Baltic and North Seas to take their cargoes into the heart of the country without transferring the goods to railroads on the coast. Craft of 1,000 tons and more will be accommodated by the canal. Lake Ladoga has an area of 7,000 square miles. It is open for navigation about 180 days out of each year, being covered with ice during the remainder of the time.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## WARSHIP DESTROYS ICEBERGS WITH FOUR-INCH GUNS

Icebergs were cleared from the path of the British warship "Renown" by the vessel's guns during the recent voyage which

FROM THE SPHERE, LONDON, COPYRIGHT BY THE NEW YORK HERALD COMPANY

**Demolishing Icebergs with Four-Inch Shells: In the Background Is the "Renown," Which Brought the Prince of Wales to America**

brought the Prince of Wales to the shores of Newfoundland on his first visit to America. Volleys of 4-in. shells were fired at the larger floating mountains of ice, reducing them in a few minutes to fragments incapable of damaging the craft. Numerous bergs were sighted on the trip, the boat passing within 300 yd. of two at night. These were revealed by the ship's searchlights, and easily avoided.

## NAVY'S LARGEST SUBMARINE BREAKS SPEED RECORD

Speedy enough to cruise with a fleet of warships, and also suitable for independent operation, the "AA-1," the largest and swiftest submarine in the American navy, recently completed its trials off the coast of Massachusetts in a very satisfactory manner. Running on the surface, the boat made 24.08 miles an hour, establishing a new world's record for submarines propelled by a certain type of oil-burning engine. Submerged, the vessel attained a speed of 14.56 miles an hour. The most powerful motors of their kind ever installed in an underwater craft drive the "AA-1." These are capable of developing 4,400 hp., considerably more than the previous maximum, 3,600 hp., used in British and German submarines. The vessel is about 270 ft. long, and has a surface displacement of 1,150 tons. It is equipped with the latest safety devices and is heavily armed. Two other boats of the same type have been launched, and will be given trials in the near future.

## MOUNTED POLICEMAN PURSUES QUARRY DOWN CELLAR STEPS

The volunteer policemen who lately guarded the streets of Boston often displayed an enthusiasm which proved as effective as it was refreshing. An example is offered in the act of a mounted patrolman who rode his horse into a basement butcher shop. He had given chase to a hoodlum who dodged and doubled in an attempt to "shake" his pursuer. The officer urged his horse close on the heels of his quarry, however, and at last forced him down a flight of cellar steps into the shop. Down the steps went officer and horse, to make an easy capture before the astonished customers. The fugitive was equally taken aback by such ruthless disregard for the proprieties.

**Down the Steps and into the Butcher Shop Rode the Mounted Policeman When a Hoodlum Tried That Avenue of Escape during the Recent Riots in Boston**

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Capable of Traveling at the Rate of 40 Miles an Hour, This Motorboat Is Not Simply a Speed Craft. It is Equipped with Sleeping Quarters for Six Persons, a Kitchen, and a Toilet

## SPEEDY MOTORBOAT EQUIPPED WITH CRUISING COMFORTS

It is not uncommon that motorboats built especially for racing exceed a speed of 40 miles an hour, but the attainment of that velocity by a gasoline-propelled cruiser, designed for comfort on long voyages as well as fast traveling, is a noteworthy achievement. Such an accomplishment is credited to a craft of the latter classification which was tested recently near Detroit. The boat is 36 ft. long and has a beam measurement of 9 ft. It is equipped with a 12-cyl. aviation-type motor, capable of developing 400 hp., and has a double hull which is described as nonsinkable. Sleeping accommodations for six persons are provided in a luxuriously upholstered cabin forward and a sheltered cockpit aft, while there are also a kitchen, a storeroom, and a toilet on board. During a trial the craft covered 35 miles in 52 minutes, which is at the rate of 40.38 miles an hour. On another occasion a speed of 39.45 miles an hour was maintained for 15 miles.

## NEW GASOLINE POWER PLANT QUALIFIED FOR AERIAL USE

Peculiarly fitted for air-craft propulsion is a strange new gasoline engine designed by an American inventor. In shape and size much like a nail keg, it requires remarkably little space, hence develops little head resistance. In spite of the 465 hp. claimed as its rating, its weight is small (1.44 lb. per hp.). Freedom from vibration also recommends it for aerial use. Little can be learned about the workings of the odd power plant, as it is not to be produced in quantity until next year, but with regard to this last point the inventor explains that 20 power

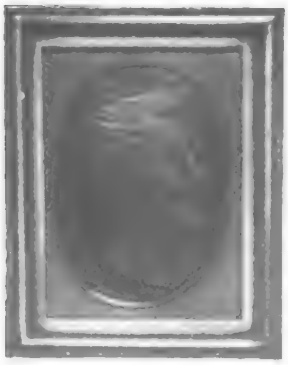
Out of the Mystery That Surrounds This New Gasoline Engine, Designed by an American Inventor, Comes the Information That It Works without a Crankshaft

impulses are imparted for every revolution, spaced at regular intervals of 18°. It is also revealed that the engine has no crankshaft.

¶In its investigation of grade-crossing accidents the railroad administration has found that the average passenger train obstructs a crossing less than seven seconds.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

## LINCOLN'S PROFILE EMBOSSED ON TIN FROM OLD HOME



A sheet of tin stripped from the roof of Abraham Lincoln's old home in Springfield, Ill., bears a remarkable profile of the famous president, embossed with a hammer and punch by a workman who assisted in removing the original covering of sheet metal, when the residence was repaired not long ago. A frame was fashioned of the same material for the likeness. The house was occupied by the great emancipator at the time of his election to the highest national office, and is preserved because of its historical value.

## TELEPHONE LINES IN INDIA NOW RUN LONG DISTANCES

Long-distance telephone lines in India have recently been greatly extended. A 600-mile line from Simla to Peshawar is finished, but needs modern equipment to be of commercial value. From Simla to Lahore a line over 300 miles long is now in regular service, as is a line west from Calcutta into the Chota Nagpur coal fields. An 80-mile Bombay-Poona line is in official use, though not yet ready for public service.

## SHARK SEINES AID MARINE-LEATHER PRODUCTION

Faced with an alarming scarcity of hides, the world for some time has turned to the sea for a supply, with the result that a new industry is developing at various points on our coasts. Recently immense seines have been devised and used for the capture of sharks and other fish whose skins can be converted into leather. One of the nets that has proved very successful in this unusual fishing is 600 ft. long and 18 ft. deep, with a 4-in. mesh of heavy twine. It is operated from small boats, and as many as 200 sharks have been taken with it in a single day.

Experiments conducted under government supervision have disclosed the fact that tanned shark skins are suitable for shoe uppers and other articles. Five hundred fish skins are treated weekly at one tannery devoted to the production of marine leather, and plans have been made for greatly increasing this output during the next year. Each hide contains from 10 to 40 sq. ft. of exceptionally strong leather, and is sold at a price depending upon the quality. Valuable by-products are obtained from the flayed bodies of the fish, including fertilizer, glue, oil, and musical-instrument strings. The skins of certain whales, porpoises, rays, and devilfish also can be utilized. Formerly these inhabitants of the sea were regarded as worthless. Now they are expected to become important factors in the leather market.

Seining Sharks: At the Left One of the Monsters has been Hoisted into a Boat and is being Disentangled from the Net. A Hammerhead Shark, Fresh from the Sea, is Shown at the Right

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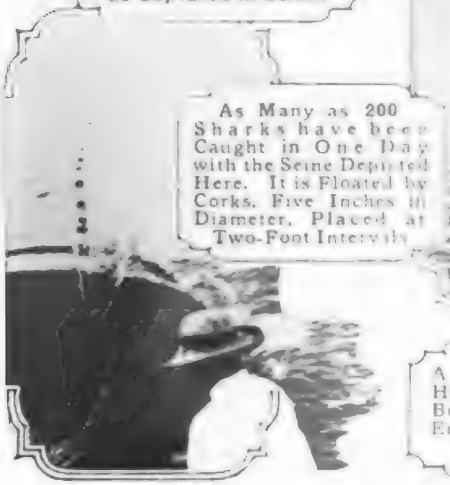
Placing the Great Seines in the Water Is No Easy Task. Made of Heavy, Tarred Twine, the Nets Are 600 Feet Long and 18 Feet Deep, with a Four-Inch Mesh

Small Boats, Equipped with Cranes, are Used by the Shark Fishermen. This Picture Shows a Sand-Bar Shark, Captured in a Seine, Being Lifted from the Sea

Now and Then a Clumsy Loggerhead Turtle Wanders into the Big Seines, and is Made a Captive by the Shark Hunters. The Shell of This One is Covered with Barnacles

Properly Tanned, the Skin of This Salt-Water Monster will Provide Material for Many Pairs of Shoes or Other Articles Usually Made from the Hides of Land Animals

Though Related to the Shark, the Ray, or Devilfish, does Not Resemble It. It is Found in Large Numbers in the Warm Waters off the Coast of Florida, and can be Captured in Seines



As Many as 200 Sharks have been Caught in One Day with the Seine Depicted Here. It is Floated by Corks, Five Inches in Diameter, Placed at Two-Foot Intervals

A Dangerous Specimen: One Blow from the Powerful Tail of This Huge Tiger Shark would Break the Crane, and Possibly Capsize the Boat. Therefore, Great Care must be Exercised in Hoisting the Enormous Fish Aboard. Until the Discovery That Its Skin could be Utilized, This Shark was Hated and Feared

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*



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## PATENTED CONCRETE HIGHWAY BUILT IN THREE STRIPS

Conservation of material and labor is possible in the construction of concrete highways built according to plans recently invented and patented by a resident of Jacksonville, Fla. Instead of the usual single wide strip of smooth surface, there are three strips in the new road. A center strip, 5 ft. wide, is flanked by two strips, 2 ft. 6 in. wide, with intervening ground space. The three strips are bound together at regular intervals by buried reinforced concrete. At necessary points, drainage pits are built underneath the surface of the road. Water that collects in these is carried away by 8-in. tile. Two vehicles can pass without difficulty on the strips.

Three-Part Road in Use: Vehicles can Pass One Another without Leaving the Strips, Which Require Less Material and Labor to Build Than an Ordinary Concrete Highway. An Intersection Plan is Shown in the Insert. This Method of Construction was Devised by a Southern Inventor

## ALARM BELL GIVES WARNING WHEN CAR IS STOLEN

Driving a stolen automobile is made a noisy, and therefore dangerous, operation by a novel device which has been placed on sale in England. Inclosed in a box intended to be fastened underneath a car is a bell and a ringing mechanism, designed to sound a loud alarm when the machine is moved, and to continue to do so until the vehicle comes to a stop. A strong lock protects the contents of the box. It is necessary to open the latter to set the contrivance or to render it inoperative.

## ODD FORMS OF ARMY TRACTOR RECOMMENDED BY OFFICERS

Among the new forms of army equipment whose development is declared necessary by a board of officers appointed to study the question, are three types of tractor distinctly novel and quite out of the ordinary. One is a small endless-tread machine without power, to serve as a wagon drawn by two men, the tongue acting as a lever to turn the wheels with a ratchet when necessary. Another, a little larger and engine-driven, would be operated by a man on foot, and used for carrying heavy machine guns, ammunition, and men, and for laying wire. The third would practically replace the horses of individual mounts, carrying two men. It would be low, about 40 in. wide, the flexible tread being 8 ft. long and 6 in. wide, and with an engine operable under all possible difficulties.

## NEW DOUBLE-SIZE FLAX SEED YIELDS LIMPID-WHITE OIL

Inspired by the pleas of French artists for an oil that would not dull their pictures, a noted American horticulturist has succeeded in cultivating a new flax of unusual quality. The seeds of the developed plant are almost twice the size of those of the ordinary variety, are a limpid white in color, and yield about 12 per cent more oil. The experimenter started with a few seeds of light-brown East Indian flax, which for several years reverted to the dark shade: but from this unpromising source was finally developed a plant quite as productive as the old, and with the other advantages. Some $33,000,000 worth of flax seed is produced every year in America.

¶ A London factory owner believes himself the first to use an airplane engine as an ordinary power unit. Only a small part of the rated horsepower is used.

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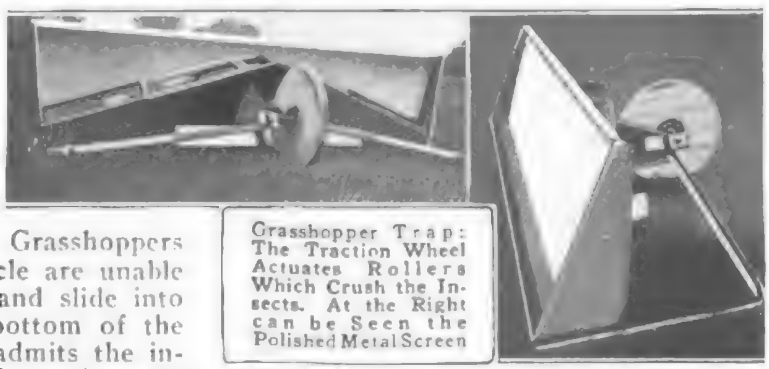
FIGHT FIRE IN BIG COAL PILE WITH PORTABLE CONVEYORS

WHEN a 16,000-ton storage pile of coal in a Maine coast yard caught fire a short time ago, all the sea water the fire boats could throw on it with twin nozzles failed to extinguish it. The salt water made the installation of coal-handling machinery useless. In the emergency, resort was made to some small portable belt conveyors. A 30-ft. conveyor was hung from an adjacent trestle, with its lower end near the coal pile, and a 60-ft. conveyor, mounted on adjustable trucks, was used as an extension. With this improvised equipment, and as many as 15 men shoveling, the coal was quickly removed, and the fire, deprived of sustenance, soon became confined to a relatively small area, and reduced to a point where extinguishing it was a comparatively simple matter. The ingenious expedient thus saved time, machinery, and coal.

## GRASSHOPPER TRAP CRUSHES PESTS BETWEEN ROLLERS

Mechanical assistance is now available for the farmer in his struggle to eliminate the destructive grasshopper, as a Wisconsin inventor has patented a device for trapping and killing the pests. The front of the contrivance, which is intended to be pushed across a field, presents a highly polished metal screen, slightly inclined backward in a rigid frame. Grasshoppers jumping against this obstacle are unable to obtain a footing on it and slide into a trough below. At the bottom of the trough a narrow opening admits the insects to a chamber lighted from above by a screened aperture. Crawling toward the light on cleats provided to facilitate that feat, the pests reach two moving rollers, actuated by a geared traction wheel at the rear of the device, between which they are crushed, and then dropped into a removable drawer underneath the rollers. The resulting mass may be fed to poultry. The device is made in sections, and several sections can be bolted together at their ends. Any suitable motive power may be employed. Enormous losses are caused by the insects, which appear in vast numbers in some states.



Grasshopper Trap: The Traction Wheel Actuates Rollers Which Crush the Insects. At the Right can be Seen the Polished Metal Screen

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## EXPLOSION DAMAGES HOUSE BUT SPARES WINDOWS

Inexplicable results were produced by a gas explosion which occurred recently in the home of a minister in a Michigan

**Residence Damaged by a Gas Explosion: Though a Gable End was Blown from the Building, No Windows were Broken by the Blast**

city. A gable end was blown from one side of the dwelling, and dropped to the ground beside the house, where it remained in an upright position. Strangely, a window in the gable end was not broken, nor were other panes in the building damaged. The blast is believed to have been caused by a spark from an electric-light switch, though this theory is not generally accepted.

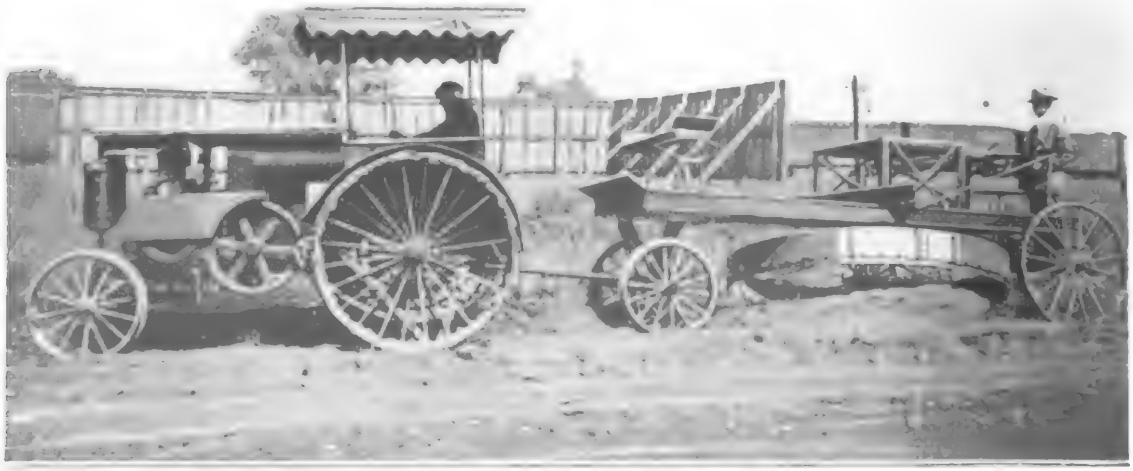
¶ Sprinkling whitewash on the surface of a carload of coal is the Chinese method of discouraging theft. The vigilant eye of the watchman easily detects the slightest disturbance of the contents.

## CONNECTED ELECTRIC SYSTEMS COVER VAST TERRITORY

Coöperation between neighboring electric-service companies, which in its concrete meaning involves many technical problems, has been carried to an extreme in the West. Final connections have just been made which establish a composite hydroelectric system covering five great states—Oregon, California, Nevada, Arizona, and New Mexico. While other groups of service companies are larger in the number of units supplied, none, it is declared, covers so vast a territory. Some 12 generating concerns are parties to the interconnection, which comes as an outgrowth of conservation measures adopted during the war.

## ROAD-GRADING MACHINE HAS BIG WHEEL FOR SCRAPER

A road-grading machine whose scraping member is a big steel-rimmed wheel on a vertical axle, instead of the usual stationary blade, has been developed by a Kansas inventor. The scraper wheel, the standard size of which is 12 ft., is slung beneath a four-wheeled carriage which is drawn by a tractor. Handwheels at the rear adjust the scraper wheel to any desired angle with the road. The 12-ft. wheel moves dirt 11½ ft. across the grade. The advantage of the wheel form of scraper is that no "waves" or ridges are formed in the soft surface of a new road, the rotating blade leaving a smooth and uniform path. It is also asserted that the new system is more rapid and requires less power than the old.



**Road Grader with Rotary Scraper: The Big Horizontal Wheel Hanging below the Bed of the Machine Revolves as It is Drawn along the Road by the Tractor, Making a Smooth, Uniform Grade. The Handwheels Regulate Angle and Depth**

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# TO THE POLE VIA AIRPLANE

By Howard Egbert

THE airplane will unveil the mysteries of the Arctic, and Vilhjalmur Stefansson, explorer, will blaze the way to the frozen North, likely in a specially prepared flying machine which his good friend Orville Wright of Dayton, Ohio, will set about to design.

"The pole can be reached by the airplane route, I feel confident," said Stefansson, following a special trip made to Dayton not long ago for the purpose of conferring with the inventor.

This visit, by the way, was a long time coming. The explorer and the inventor had never met personally. After leaving, in May, 1913, to make arctic researches for the Canadian government, nothing had been heard from Stefansson when the winter of 1914 arrived. Appeal was made by Canadian officials to Orville Wright, then living in semiretirement at his home in Dayton, for help by building an airplane that might penetrate the polar regions and either bring back the intrepid adventurer or discover where lay his grave in that northern land.

Orville Wright considered the proposition, but at that time could see no way in which a polar expedition by air could be successfully carried out. He kept the thought in mind, however, but later, when Stefansson turned up safe and sound, the matter was dropped.

Now this appeal of long ago will bear fruit. The explorer has become seriously interested in aviation as a means of reaching the polar circle, and scientists have made up their minds that such a thing is not only possible but practical. Hence the next great arctic adventure in the cause of science will be made with an airplane.

"The aerial journey to the Arctic is a thing to be still worked out," said Stefansson. "The airplane, of course, which we shall use in such a venture, must be of the seaplane type, able to rise from the water safely and speedily; descend, when necessary, either upon the ice-bound lands of the polar zone, or in whatever bodies of water we may sight and have need to rest upon. To rise from the water, an airplane must have great speed and unobstructed surface. The northern lakes and watercourses are invariably filled with floating ice, and the pontoons of the ordinary seaplane, unprotected against an encounter with the ice, would be smashed and rendered useless. Perhaps, after all, the chief use the airplane would have in such an expedition would be as an auxiliary to the exploring party. It may be that a seaplane can be sufficiently protected to permit it to safely encounter ice floes, for instance by providing the machine with a sharp cutter which would break the force of a collision between the machine and the ice pack.

"Experiences with planes in crossing the Atlantic have been of unusual service to the world of science. Exploration and aviation must go hand in hand in the future. The one is largely dependent upon the other, and if the airplane fails, not much additional light can be thrown upon unexplored regions."

In his earlier work in the Arctic, Stefansson has depended largely upon the use of dogs. "The St. Bernard, crossed with the Eskimo dog, makes the finest animal in the world for sledge work in the north," he says. "A pure-bred St. Bernard is not so good because his feet are tender, and they are apt to chafe on a hard run. Eskimo dogs are not so good because they do not have the inherent courage which is necessary. A mixture of the two breeds produces the ideal animal for our kind of rough work.



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"An Eskimo dog is a quitter when not properly fed, or from the moment he begins to tire. If his dinner is late on a long, hard run, he is apt to lie down, and all the coaxing and beating in the world will not budge him into action. It is not pleasant to whip dogs. A St. Bernard, however, has a wonderful spirit, much like that of a man who has a knowledge that a certain work has to be done and who will apply himself, despite his weariness, even to the going for days without proper food and rest."

The trip to the north pole by airplane, even with an experienced pilot and mechanicians, would be hazardous enough, Wright and Stefansson agreed at their meeting. The cold, cutting winds of the Arctic would probably soon force even an extraordinary airplane to come down, because engine trouble would be encountered with the first stiff gale. To provide against this, the first thing the inventor will have to do is to devise protection for a superengine.

The wings and frame of the proposed arctic airplane would have to be made of unusually tough fiber, to enable the machine as a flying body to withstand the stubborn winds and storms of that part of the world, and the protection of the pilots would, of course, be no small matter to be considered. Pilot cages would have to be built and electric warmers installed, to keep pilots and navigators, and other members of the party, fairly comfortable after the first jump into the frozen North.

The airplane itself, scientific men agree, would have to be, above all things a supermachine, particularly designed and built, light enough to fly, but heavy enough to defy the extraordinary climatic conditions.

## MOTOR AND SPINDLE ON ARM OF NEW RADIAL DRILL

Several features distinguish a new electric radial drill from the ordinary type of this device. One is the arrangement of the drill spindle and the driving motor, which are mounted at opposite ends of a swinging horizontal arm, sliding through a clamp on top of an upright column, and are connected by a flat belt. The latter can be adjusted by varying the position of the motor, for which provision is made. Different speeds are obtained by the use of graduated pulleys. Work can be placed on the base of the machine, on a table which is adjustable as to height, or on temporary stands at any point near the drill. A push-button switch controls the motor.

New Type of Electric Radial Drill: The Driving Motor and Drill Spindle are Mounted at the Ends of a Swinging Horizontal Arm

## HOT-WIRE TELEPHONE IS USED BY ARMY AS RANGE FINDER

Using the principle of the hot-wire telephone receiver, discovered some years ago, a British army officer designed a range-finding microphone which proved of great service in war work, and is now to be developed for possible commercial use. The apparatus is simple, consisting merely of fine wires supported in the neck of a bottle and heated by electric current. Distant gun discharges produce air fluctuations which momentarily cool the wires, their contraction giving rise to characteristic sound waves. The range is found by triangulation between two of the microphones.

¶A hotel for dogs and cats was opened a short time ago in London to care for the pets of persons leaving the city temporarily.

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## TWO LIBERTY MOTORS JOINED TO MAKE 24-CYLINDER MODEL

The sensational development of the Liberty airplane motor continues despite the end of hostilities. The War Department has now combined two of the standard 12-cylinder models to make a 24-cylinder unit of 673 hp. The combination was effected quite simply by the use of connecting rods of special design, and two regular crank-case upper halves, one being somewhat altered. The monster engine is not a freak; tests at one of the aviation fields show a gasoline consumption per horsepower only slightly greater than that of the "12." It was found, too, that the "24" weighs 1.97 lb. per horsepower as against 2.11 for the smaller engine.

## BOYCCTT OF GERMAN GOODS URGED WITH DOORMAT

German-made goods will not find a ready sale in this country if the views

**There Is Little Encouragement for German Manufacturers in This Mat, Which Lies in Front of a Pennsylvanian's Door**

of a Pennsylvanian, as expressed on a doormat, are shared by all Americans. Painted on the shoe cleaner is this terse admonition: "If You Buy German-Made Goods, Don't Wipe Your Feet on This Mat."

## UMPIRE'S CHAIR FILLS EVERY NEED AT TOURNAMENT

Ordinarily unnoticed, a humble umpire's chair created a sensation all its own at the recent national lawn-tennis tournament. The "chair" was really a cabinet raised five feet from the earth by stout wooden legs. On top sat the umpire; within were compartments and drawers containing every article of possible use in the play. One "pigeonhole" contained rackets; others held balls, sweaters, and towels. The designer pointed with particular pride to the drawer containing his

**Players in the Recent National Lawn-Tennis Tournament were Delighted with This Umpire's Chair, Which Contained Emergency Equipment for Every Imaginable Use**

emergency kit, comprising scissors, safety pins, aromatic spirits of ammonia, adhesive tape, sawdust, shoe laces, resin, chewing gum, a hammer, sliced lemons, and a number of other things.

## FRENCH BICYCLE STEERED LIKE AUTOMOBILE

The simple "bone shaker" of 50 years ago, proud of its wooden frame and wheels, would never recognize as its descendant a luxurious bicycle which has lately appeared in France. Discarding all conventional notions, the manufacturers have seated the rider in a comfortable "reclining chair," placing before him, as in an automobile, the steering column with warning horn and hand brake. The strange vehicle is peculiarly fitted for travel over smooth city boulevards.

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**Lounging in the Padded, High-Backed Seat, the Rider of This French Bicycle Pedals along the City Boulevard in Absolute Comfort**

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## SQUEEGEE MACHINE REMOVES WATER FROM FLOORS

Adapting the window-washing squeegee to floor cleaning is accomplished in a novel machine for removing excess water from floors that have been mopped or scrubbed. Rubber blades are fastened in a V-shaped frame which is carried by a three-wheeled hand truck. The end of a rubber hose, connected with a pump, bears lightly on the floor surface at the angle of the frame. Chains from the rear wheels of the truck drive the pump, which sucks the water collected by the scraping blades to a tank that is an integral part of the device.

Water Collected by the Rubber Blades of This Floor Squeegee is Transferred to a Tank on the Machine by a Chain-Driven Suction Pump

## AIRMAN SPIRALS TO FLOOR OF YOSEMITE VALLEY

A spectacular flight to the floor of Yosemite Valley was recently made by an army airman detailed to the California fire patrol. Leaving San Francisco at 6 a. m. in a heavy fog, he flew the 180 miles to Yosemite in just 100 minutes. Arriving above the spot selected for the attempt, the cañon being here roughly a mile high and a quarter of a mile wide, the airman started his descent at 11,000 ft., banked his machine on passing the lips of the cañon, and spiraled thence to the floor. Even here failure was close at hand, however, as telegraph wires, trees, and a large crowd of spectators made landing a delicate task. The airman was received by park officials and presented with a gold medal for his achievement.

## BOARD FLOOR ON RIVER BED STOPS CHANNEL EROSION

Flooring a river channel with boards is rather an unusual method of stopping erosion, but it has proved successful in the Little River drainage district of Cape Girardeau County, Mo. The velocity of the current in a narrow channel at the east end of the system was so great that the banks and bed of the stream were rapidly being washed away. Along the offending section heavy wires were stretched across the river, a short distance apart, and secured to anchors buried in the banks. The flooring, or mattress, was built of 12 to 16-ft. boards, lapped to 50-ft. lengths. Sections, six boards wide, were placed on the wires, and the whole laced firmly together to a width of 40 ft. The upstream end, weighted with rocks, was anchored with heavy cables, and as the big mat submerged, the wires tightened, and the current flowed over its new bed. The whole 300-ft. length of the mattress was riprapped to protect the banks.

The Mattress of Boards, Laid to Form a Floor on the River Bed, is Seen at the Left as It Is Beginning to be Submerged; at the Right All of the Completed "Floor" Is Visible, Showing the Manner of Construction

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Girls in the Inspection Department Examining Negatives after Development, to Make Sure That No Mechanical Defects Are Present When They Leave the Laboratory to be Sent to the Printing Plant

developed, he selects the best for his picture. The rest are thrown away. Or he may, and usually does, combine a few feet of this film, with a few of that, and make his finished picture a thing of greater variety.

"Close-ups," as the large views of actors' faces are called, are made a few feet and even inches from the face itself; enlarging is seldom resorted to as the result is less effective than a picture obtained by the short-focus process. It is interesting to observe in passing that the tears that show in "close-ups" of weeping actresses—those marvelously realistic tears—are usually drops of glycerin which are placed on the eyelids before the camera begins clicking, and, large and lustrous, roll down the cheeks slowly enough to suit the photographic process.

When the story has been recorded by the camera, the sections of the negative

In the Assembling Room the Short Lengths of Film, Representing the Various Scenes of the Complete Film, are Patched Together by Girls, Who Work According to the Instructions of the Director, Inserting "Leaders" and Cutting Out Overlapped Scenes. The Insert Shows One of the Operators Cutting the Film before Cementing It

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**Automatic Film-Printing Machines: The Right-Hand Reel on Top of Each Machine Contains the Negative, the Left-Hand Reel the Positive Stock. The Exposure Period is Set with a Dial on the Front, which is Adjusted to Suit the Particular Printing Qualities or Requirements of Each Piece of Negative**

that are to be used in the completed picture are shipped to the printing laboratories, many of the California companies sending their negatives to a laboratory in Chicago, whose central location makes it a natural distribution point.

Along with the film sent to the printing establishment goes a descriptive text from the director, giving instructions as to which scenes are to be given, and also sections of film bearing the subtitles, or "leaders," which have been drawn and painted by artists and then photographed at the studios.

Huge insurance, often running as high as $200,000 or $250,000 apiece, is placed upon these original films, known as "master negatives." It is extremely important that no accident or even atmospheric change affect this negative, for if it is harmed, the whole costly process of photographing must be gone through again.

The printing factory is a sealed and carefully tested building. Its interior is kept at a uniform temperature, about 78°, summer and winter. Even the heat radiating from the bodies of the employes is considered and taken into account in regulating the artificial heating of the room, for the gelatinous nature of the raw film requires the most exact care, or it will melt or harden and render a film useless for exhibition. Similarly, every ounce of air that enters the building is washed by running water, for a speck of dust might otherwise alight on a precious negative, ruin the facial expression of the starring actress, and cost the picture its "punch."

After expert cutters have assembled the pieces of the master negative according to the directions, and inserted the subtitles at the exact points scheduled, the film is sent to the printing room, where copies of it are made. It is the copies, never the original negative, that one sees in picture houses. The master negative is too precious to be intrusted to the handling of an indifferent operator.

Of the average film, 50 to 75 prints are made, but in the case of one of the most popular cinema comedians, as many as 250 to 275 prints have sometimes been required. When repeated inspection has assured the laboratory superintendent that the negative is according to directions, he has it carefully washed and cleaned and then sent to the printing room, with detailed instructions how long to expose each picture; when to change the time to catch the sunlight scenes; when, to catch the midnight-ride scenes, and when, to show the hero feeling his way through the blackened cave.

At the printer's left hand is a reel of "positive stock," which appears milky

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white in the red light of the room. This positive has been perforated on a neighboring machine shortly before. The printer starts the positive entering his machine at one slit, the master negative at another. Electricity draws them through, turning tiny sprockets in the machine's interior. Passing before a strong light within the machine, the positive has every image of the negative photographed upon it. It emerges and is reeled up and carried off to the developing room, while the negative is reeled back onto its stand at the printer's right hand and is ready to be used on the next reel of positive.

In the Drying Room, the Developed, Fixed, and Washed Prints are Wound on Great Drums and Rotated Until the Films are Perfectly Dry

It is especially important that static electricity be absent from this printing room, for its presence will cause fine, irregular lines to appear in the film, which may sometimes totally ruin it.

Passing from the printing room, the positive is unreeled and wound about a rack, so that it does not overlap or touch in any of its sections. Cut into lengths of about 400 ft., it is moved automatically down through vats containing the developing fluids. These liquids are kept in constant circulation, and at a constant temperature. Emerging from the first vat, expert workmen lift the positive out, and place it in open baths, permitting it to remain for a certain period, the time of which is exactly told by electric lights that flash on when the rack enters and off when the time is up. At certain times the developer and washes drain away. Their usefulness has been chemically foretold, and at the exact moment when they would become dangerous to the best appearance of the film, they run off and fresh fluids fill the containers. All through the various fixing baths this mechanical precision is maintained. The water enters the plant through five filters, each of which is guaranteed to take out all impurities. The character of the water is chemically tested, and it is treated to remove its hardness, which causes air bubbles to spring up in the film. It would be an object lesson to any amateur photographer to observe the painstaking care with which the washing processes are executed in moving-picture work. Hundreds of times, it seems, the racks are agitated in fresh water, over and over again, until all hypo and silver salts are removed. When the time is up, the racks are set up before strong red lights and experts go over the positives to detect, if possible, the slightest irregularity in photography or printing. When pronounced perfect, the film is sent, by dumb-waiters, to the floor above, known as the drying room. There it is placed on a specially constructed stand and reeled onto huge wheels, which whirl rapidly in a light, even-temperatured room until the last atom of moisture is removed from it. Each of these great lath drums will dry 4,000 ft., or four reels, of film an hour. A perforating machine will prepare some 28,000 ft. per hour. A printing machine cannot be so easily timed, since some scenes require much longer time than others, and a series of interior scenes demand longer exposure than a sequence of, for instance, snow pictures.

When the film is to be tinted or toned, it goes to the color room before it ascends to the drying room. Experts, long schooled in the art, are the only workmen who are intrusted with the tinting and toning processes. In the tinting work the whole picture is stained, while in the toning certain parts are touched to differentiate them from the rest of the scene. When the negative leaves this

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color room and goes onto the drying drums, night scenes are blue, sepia interiors amber, pure black-and-white sunlight scenes gray.

At the moment the film is thoroughly dry, it is reeled off into a compact roll again, a specialist standing at its side, scrutinizing each foot of it to detect any errors that might have escaped other inspectors. If poor photography is evident, that section is clipped out and an order sent through for a "repeat." The printing machine sends that part of the master negative through again, the strip comes down the line, and, if perfect, is simply glued into the positive at the proper point.

In these laboratories, corps of chemists are working constantly on new hypos and developers, seeking to find solutions that will give novel effects to the films. Stereoscopic pictures are certain to be developed in the near future, but beyond that event, the principal artistic progress of moving pictures will be made in new chemical treatments and solutions which will heighten the pictorial value of the scenes. That these experiments are productive of interesting and valuable results has already been demonstrated on the screen, where each innovation makes its début as soon as it is perfected.

Automatic Perforating Machines Make the Holes along the Edges of the Unexposed Film Stock, to Fit the Sprockets of the Camera and the Projecting Machines in the Theaters. Only Nonactinic Light is Allowed to Enter This Room. The Film, When Purchased, Has No Perforations

## HARVESTER FOR CLOVER SEED PICKS RIPE HEADS ONLY

A large harvesting machine for clover seed that picks only the ripe heads, leaving the green plants for later gathering, has been invented by an Indiana farmer. A revolving brush knocks the hulls out of the ripe heads by striking them against a table, which also helps to remove the dust. The suction of a fan picks up the hulls, and after the seeds have been extracted in a separating drum, a blast of air driven up through a screen blows out the remaining dust. The harvester may be operated repeatedly over the same field, as the seed continues to ripen. It is drawn by a team of horses or a small tractor, requiring comparatively little power for so large a machine.

¶A British highway engineer has computed that 85,720 pairs of old shoes are necessary for every mile of dustless road made of a patented slag, rock, asphalt, and scrap-leather composition.

Left, Front View, and Right, Back View of Clover-Seed Harvester Which Takes Only the Ripe Heads, Leaving the Green Standing for Another Day: The Seeds are Knocked Off by a Brush and Picked Up by Suction

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## HUGE STATUE IN CITY PARK WELCOMES VISITING FLEET

A heroic statue of the traditional "Uncle Sam" formed part of the decorative scheme which helped to enliven Los Angeles at the time of its recent welcome to the new Pacific fleet. With arms crooked in characteristic sailor fashion, Uncle Sam smiled down, from his height of 25 ft., on thousands of sight - seeing officers and sailors from every state in the Union. The statue was given a position of prominence, being placed at the entrance to Pershing Park in the heart of the business district. Comparison with the figures at the base reveals its size.

## OBTAIN IMPORTANT TRINKETS IN MOUND-BUILDER'S TOMB

Digging into the tomb of a mound-builder chief near Newark, Ohio, scientists recently discovered ancient trinkets which they declare establish the fact that the stone-age inhabitants of the locality belonged to the same tribe whose earth monuments are found in other parts of the state, notably Ross County, where similar research work has disclosed surprising evidence of prehistoric culture. The sepulcher is located near the flint quarries from which aborigines obtained material for arrowheads and other implements. It is made of small stones, and buried in a circular mound of earth, about 13 ft. high. The chief's skeleton indicated that he was a man nearly 6 ft. tall, and over average weight. Underneath the bones was found what is considered the most important article taken from the excavation, a copper gorget, believed to have been a token of authority or rank. Other objects of interest were copper earrings, an armlet of the same material, and beads made from sea shells, which evidently had been worn as a necklace. Every part of the tomb was carefully examined by the researchers.

Great Importance is Attached to the Ancient Copper Gorget, Pictured on the Left, Which was Taken from the Tomb of a Mound-Builder Chief, near Newark, Ohio. It is Supposed to have Been a Token of Rank or Authority. The Bones of Its Owner were Carefully Uncovered by Scientists

Interior of the Tomb, Showing the Skeleton: In the Vicinity of the Burial Place are Located Numerous Stone-Age Flint Quarries

This Picture was Taken in the Few Minutes between the Airplane's Descent on and Ascent from the Roof. This, the First Performance of Its Kind in the World's History, was Done with No Previous Planning or Preparation. The Air Being Quiet, the Airman Was Able to Bring His Plane Down Squarely on the Peak of the Sloping Roof. The Take-Off Was No Less Hazardous, Yet Equally Successful

## AIRMAN LANDS AND TAKES OFF FROM BUILDING ROOF

A Frenchman was the first to land an airplane on a roof; but America claims the first airman to both land and take off from such a limited surface. The performance was altogether unpremeditated, being resolved upon while the airman was flying above a quartermaster building in Newark, N. J. Spiraling down, he straightened out just above the roof which slopes gently on both sides of the peak. He gauged his position nicely and was able to plant one landing wheel on either side of the rooftree. When his plane had rolled to a stop, the airman had it pushed backward to the farther end of the roof. Here it was held by a number of spectators until the signal to "let go" was given, when the plane dashed down the rooftree and took to the air just a few feet from the other end.

## ROARING TORCH OF OIL GAS BLAZES HIGH IN AIR

A terrifying torch of natural gas, its roaring flame leaping 300 to 400 ft. into the air, was the phenomenon that followed a recent drilling in the California oil fields. The gas was ignited, presumably, by a spark when some flint bowlder, ejected by the enormous pressure, came into contact with the steel casing. As a night spectacle the huge blaze, lighting the fields as bright as day, attracted great numbers of visitors, including an army of birds and insects. The method of extinguishing such fires is to blow them out with steam, and pipes from 20 boilers had to be run to this one, the men working behind shields to protect them from the intense heat. The derrick and drill pipe, of course, were destroyed in the first burst of flame.

Burning Gas Well with Flame 300 to 400 Feet High: The Wreckage of the Derrick and Drill Lies at the Foot, the Square Objects Being Shields for the Workmen

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## DRIVEWAYS TO THREE FLOORS OF NEW HOTEL GARAGE

Driveways on different levels make it possible to drive automobiles into entrances to all floors of a modern three-story hotel garage recently completed in an eastern city. The building is located on the side of a steep hill, with one end partly buried in the earth. Little labor was required to make the driveways, which are like huge steps in the slope, each one at the height of a floor. The lowest has a slight downgrade toward the garage, the second is nearly level, while the third has a barely noticeable upgrade. Three hundred cars can be housed in the structure.

Built on the Side of a Hill, with One End Partly Buried in the Earth, This Three-Story Garage Has Driveways Leading to All Floors. In the Background Is the Hotel to Which It Belongs

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The notorious Moroccan bandit, Raisuli, is taking photographs of his battle scenes, in modern style; and now he is looking for a motion-picture photographer to record the movements of his uprising. So far the adventurous camera men have not crowded the opportunity, remembering that many enter the Raisuli stronghold, but few emerge.

## GERMAN BATTERY IN BELGIUM HAS INTERESTING POINTS

Artillery installed by the German forces along the coast of Belgium is being studied with considerable interest by military students. The most powerful battery, one of the North Ostend group, consists of four 15-in. guns, each over 56 ft. long. The big guns pivot on ball bearings, and are aimed horizontally by a rack and pinion driven by a chain from an electric motor hung below the carriage in a steel cradle. A great sliding nut on a huge inclined screw elevates the barrel, this too being operated by a motor hung from the opposite side of the carriage, and working through a two-speed change gear shifted by a hand lever. Both motors drive through clutches, giving fairly accurate ranging, which is completed to precision by handwheels.

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## ARMY TRUCKS BREAK BRIDGES ALONG WESTERN HIGHWAY

Within a 400-mile length of the Lincoln Highway through Wyoming, the long train of army trucks now on its way across the continent broke through a total of 47 different bridges. One of the objects of the trip was to demonstrate that some of the country's highway provisions are inadequate to the severe demands of military work. The broken bridges were promptly reconstructed by the engineers who accompanied the train for that purpose. Their collapse was no reflection on their design, for they were amply strong for tourist traffic.

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## SHIPLIKE LUMBER RAFT TOWED LONG DISTANCE

A gigantic shiplike raft, containing thousands of feet of sawed lumber, recently was towed from Hommelvik, on the coast of Norway, to Harwich, England, with the loss of only a few timbers en route, in spite of rough weather. The trip of over 1,000 miles was made in eight days behind a 1,200-hp. tug. Two electric cranes and a large force of men were kept busy two weeks disassembling the great mass of wood, which was 360 ft. long, 40 ft. across, and 18 ft. thick. Comparatively few pieces were water-soaked, and none was actually damaged by the long voyage.

Constructing the raft was no small task. The first step was the building of shipways on the beach at Hommelvik. Heavy crossbeams were laid between the ways and parallel with them on blocks

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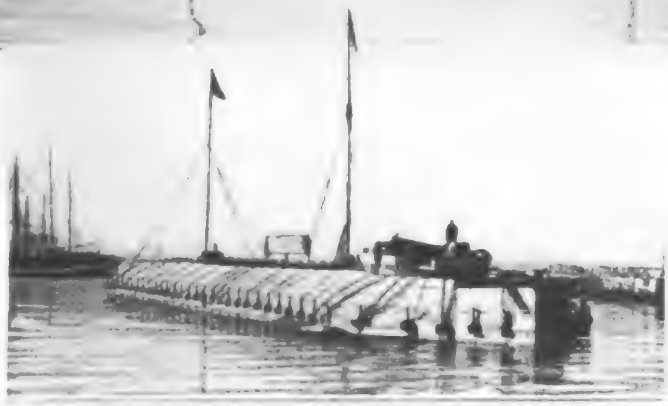
Broadside View of the Great Lumber Raft as It Appeared Just before Starting on Its Long Voyage from Hommelvik, Norway, to Harwich, England



In This Picture can be Seen the Pointed Prow of the Raft, and the Cabin. The Latter Is Located Forward of the Foremast, and will Accommodate a Crew of Eight Men

Firmly Bound Together with Bolts and Cables, This Ship-Like Collection of Timbers was Towed 1,000 Miles with the Loss of Only a Few Boards

that held the timbers level with the latter. To the beams a double floor of planks was nailed, and around the floor was erected a 6-ft. wall of boards, brought to an acute angle at one end to form a prow, and fashioned to resemble the stern of a vessel at the other. Lumber was laid in the crude hull, with ends overlapping, to a height of 6 ft., before the half-completed raft was launched. Six feet more were added to the thickness of the load at a wharf.

Bolts running through the raft from the ends and centers of the crossbeams, and through similar timbers laid across the top of the raft, held the boards together. Springs were placed under the nuts on the bolts to allow for expansion. Over the upper crossbeams more lumber was laid, to form a convex surface. This portion of the raft, which might be called the deck cargo, was fastened to the upper crossbeams with steel cables and center bolts.

Near the bow end of

Building the Raft: Above are Shown the Ways, with the Partially Completed Floor upon Them. At the Right, the Sides Are in Place, and the Hull is being Filled with Timbers. Soon After the Latter Picture was Taken, the Raft was Launched

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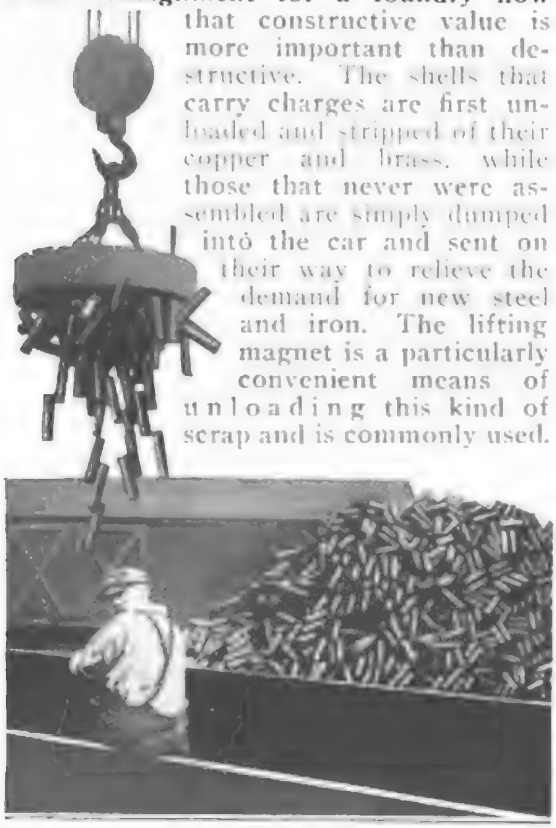
the raft a cabin was built, projecting about 3 ft., and capable of accommodating eight men. A rudder was placed in a steel frame at the stern, and steering gear was installed in front of the cabin.

## TONS OF DISCARDED SHELLS ON WAY TO FOUNDRY

A carload of big-gun shells is no unusual consignment for a foundry now that constructive value is more important than destructive. The shells that carry charges are first unloaded and stripped of their copper and brass, while those that never were assembled are simply dumped into the car and sent on their way to relieve the demand for new steel and iron. The lifting magnet is a particularly convenient means of unloading this kind of scrap and is commonly used.



Carload of Discarded Shells being Unloaded with a Lifting Magnet at a Foundry Where They were Sent to be Metamorphosed into Machines and Implements

## ADULT DAY SCHOOL EXTENDS WORK OF EVENING CLASSES

In establishing evening classes for foreigners, and other adults anxious to fit themselves for American life, city authorities have commonly made no provision for the large number of workers who labor at night. In Chicago, however, the Board of Education has seen the need and now provides free instruction at the Haven school, located near the loop, both morning and afternoon. Foreigners may here learn to speak, read, and write the English language, or may prepare themselves for application for citizenship papers.

## ORE SHIP'S GAS-FILLED HOLD SCENE OF HEROIC RESCUE

Tucked into the stern of a huge ore freighter, lately tied to a Philadelphia dock, is a deep water-ballast tank that was recently the scene of a near-tragedy. Lantern over his arm, the chief engineer had climbed down the ladder and set foot in the stale water covering the bottom. The mate, peering down from above, saw the "chief" totter and fall, and the lantern snuffed out by the water. Realizing at once the presence of poison gas, he shouted an alarm. Sailors and dock workers scurried vainly after gas masks; but two young assistant engineers, loyal to their chief, clambered immediately into the black pit—and were themselves overcome. Fortified by a stream of compressed air from the air hose, two more rescuers descended. As they struggled in the darkness they fell also, but not until the three engineers had been lifted to the deck.

## WALLS OF OLD ADOBE CHURCH PROPPED BY BUTTRESSES

Destroyed in 1680 and rebuilt in 1710, San Miguel chapel in old Santa Fé, N. M., is one of the most ancient ecclesiastical structures in America. The infirmities of age are now creeping upon it, however, the disintegration of the adobe brick causing the walls to bulge. Church authorities are naturally unwilling to see harm come to the old structure, so have caused the erection of heavy stone buttresses to hold the walls in place, for a time at least. The modern concrete work contrasts decidedly with the old adobe construction.

Left, the Construction of Stone Reinforcements against the Chapel Wall; Right, a Completed Buttress

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Fitted into This Modern Gypsy Van, with an Economy of Space Seldom Seen outside Shipboard, Are an Oil Cooking Range, a Folding Bed, a Refrigerator, Cupboards, Curtained Windows, and a Dozen Little Household Luxuries. The Comforts of This Snug Traveling Home are to be Enjoyed by a Husband and Wife Who will Tour the United States in an Effort to Recover the Husband's Health

## COMFORTABLE HOME BUILT ON AUTOMOBILE CHASSIS

Gypsies have wandered through the countries of Europe for the last 500 years, but it has remained for an American shoemaker and his wife to do the thing in unprecedented style. Ordered to live in the open air after an attack of "flu," the shoemaker decided to tour the United States. By means of a publicity scheme, he secured the coöperation of the local chamber of commerce, hired a carpenter, bought an automobile chassis, and built his unusual home. It boasts only one room, it is true, but therein are concentrated comforts and conveniences sometimes lacking in a five-room apartment. It is lighted by electricity, heated by electric radiators, equipped with an oil cookstove, a refrigerator, a folding bed, a table, chairs, and a day couch.

## ANTI-AIRCRAFT PROJECTILE EXPANDS TO LARGE AREA

Somewhat reminiscent of the old-time "chain shot," familiar to those who look at the pictures in the back of the dictionary, is a strictly modern form of anti-aircraft projectile designed by a Cincinnati automobile man. Of the conventional outside shape, the new projectile is split longitudinally into four parts, fastened together by long chains carried inside the casing. Rapidly rotated by the rifling of the gun, the novel missile flies apart by centrifugal force on leaving the muzzle, and becomes a huge ring, covering an area a hundred times the size of the gun caliber. An alternative arrangement is to release the fastenings by a time fuse, set for the range of the target. The design was inspired by the demonstrated ineffectiveness of ordinary projectiles against air craft.

Successive Positions Assumed by the Split Projectile After It Leaves the Gun: The Insert Gives Cross and Longitudinal Sections of the Missile

¶The use of rushes for reinforcing concrete is said to be particularly valuable in the construction of thin-walled structures such as ships.

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## MECHANICAL HAND OPERATED BY MOVING SHOULDER

With many former fighting men minus arms, appliances for the remedy of such loss are receiving considerable attention,

Attachment for Artificial Arms: Tin Cups, Hats, and Other Objects can be Grasped and Lifted with the Curved Jaws. On the Right are Shown the Details of the Interesting Device

and numerous new devices of this kind are being placed on the market. Among these is a contrivance manufactured by a Canadian firm to serve as a hand. It consists of two hooklike jaws, held together by a spring, and designed to be opened by pulling a cable attached to a lever on one of the members. The hand is screwed to the end of an artificial arm, and the cable attached to a harness which passes over the opposite shoulder. A slight forward movement of the latter opens the jaws, and objects inserted between them are held firmly by the spring.

## BIG CALIFORNIA MOVIE PLANT TO SERVE MANY PRODUCERS

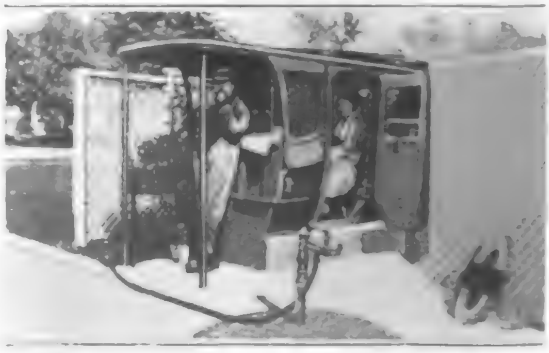
One of the southern California film-producing centers is to have a huge new studio and plant, designed to serve as many as 30 movie-making concerns at one time. The buildings will cover about half of a 40-acre field now used for flying, the total cost being estimated at $1,500,000. One stage will be 100 by 480 ft., divided into eight parts; two, 100 by 360 ft., will take six companies each, and two, 100 by 350 ft., will serve five more apiece. Factory floor space of 80,000 sq. ft., containing all necessary departments, will connect with the stages by a 30-ft. runway, 1,000 ft. long, with electric trucks to transport the materials. Each tenant company will have its own administration building.

## SNOWBALLS FORMED BY WIND IN SOUTHERN MAINE

Eccentric nature romped in southern Maine last spring and strewed the country with some remarkable playthings, countless snowballs of varied size, formed without the aid of human hands. A heavy snowstorm was followed by sunshine and a high wind. The latter, coming in gusts, picked up small quantities of the partly melted snow and blew them across the fields. As the collections of flakes traveled, they became more or less ball-shaped and increased in size by gathering snow from their paths, and came to a stop only when their weight became too great for the wind to move. In one case a ball was rolled 36 ft. before it stopped. The diameters of the spheres ranged from 2 in. to 2 ft. Larger balls were formed on slopes, where the incline assisted the wind.

## OLD LIMOUSINE BODY SERVES AS CASHIER'S OFFICE

Its passenger-carrying life over, an old limousine body is serving in a western city as an office for the cashier of an automobile filling station. A shelf has been built over the front seat, behind which the money handler sits, and on this is placed a cash register. The body is supported by a concrete foundation, and made more attractive by flower boxes and a latticework fence.



**This Old Limousine Body Makes a Convenient Office for the Cashier of an Automobile Filling Station in a Western City**

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# HARDWARE STOCK REPRODUCES STATE SEALS

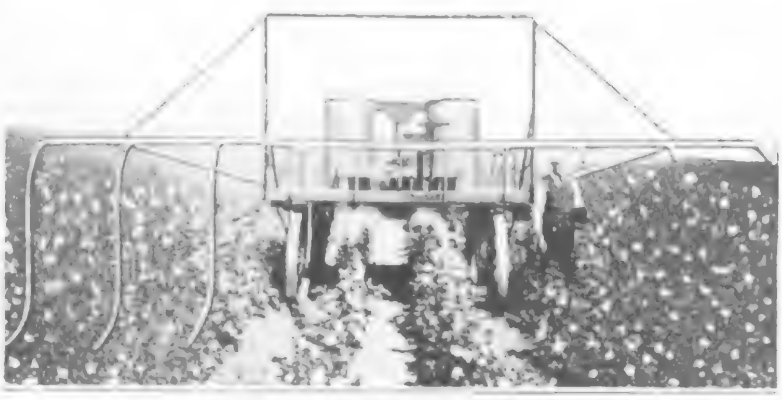
Reproductions of State Seals, Built Up of Standard Hardware Stock, of Which There Are 1,055 Pieces in the Alabama Seal, 829 for Florida, and 285 for Georgia: Hinges, Tools, Razors, Pocketknives and Scissors, Drawing Instruments, and Other Articles were Used

It Required a Total of 1,358 Pieces of Hardware-Store Stock to Make the Seal of the State of Tennessee, Besides Much Patience and Labor

Hardware stock lends itself to the assembly of astonishing images, as the window displays of retail stores not infrequently testify. An ambitious effort of this kind was recently revealed in the construction of a number of state seals with standard material. That considerable labor was involved, not to mention unusual patience, is shown by the fact that the seal of Tennessee took 1,358 pieces; the Alabama seal required 1,055 pieces, and those of Florida and Georgia, 829 and 285 respectively. Taking the least of these as an example, the seal ring was made of fancy hinges, pliers, wrenches, aluminum letters, house numbers, and trade-marks. The columns consisted of scissors and pocketknives; the base, of manicure instruments; the cornice and arch, of razors and knives; the sun, of a protractor and sacking needles, and the soldier, of sand and emery papers and rubber packing.

## COTTON-HARVESTING MACHINE USES VACUUM SYSTEM

Economically important in the highest degree, and of special interest in the South, if practical, is a cotton-harvesting machine that recently passed preliminary tests satisfactorily. A vacuum system is employed, this comprising an air-suction pump, connected through two tanks to a long manifold on which several lengths of hose are attached. All the parts are mounted on a truck, which is propelled by the gasoline engine used for actuating the pump. Each hose terminates in a nozzle designed to admit cotton, but to exclude foreign material, such as leaves and sticks. Cotton is sucked out of the bolls and carried through the hose and manifold to the tanks, where it is dumped into sacks. When a sack is filled, it is replaced with an empty one. As many rows of cotton plants as there are hose



Cotton Harvester in Operation: Fiber is Removed from the Bolls by Suction, and Carried through a Hose and the Manifold to the Vacuum Tanks, Where It is Discharged into Sacks. The Machine can be Used for Spraying the Plants with Insecticides

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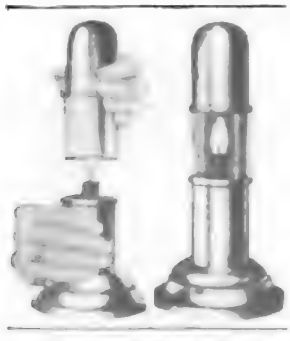
can be stripped of their fiber simultaneously. By disconnecting the manifold from the tanks and attaching it to the exhaust pipe of the pump, the harvester is converted into a blower for applying powdered insecticide.

## LIGHTED SIGNS TAKE PLACE OF TRAFFIC POLICEMEN

Small towns on busy highways frequently have to cope with traffic as dense as that of big cities. For regulation after dark, a light on a post, nicknamed a "silent policeman," generally does duty at each crossing. A Kentucky village has improved this system by installing neat iron signposts on concrete bases in the middle of the crossings, a sign facing each street. Above the sign is a powerful electric light with a metal cap that serves as both a protection and a reflector, so that the nocturnal motorist has no excuse for not "keeping to the right."

## CANDLE'S SENSITIVE FLAME IS VENTILATING GUIDE

As is well known, the supply of oxygen in a closed room may become inadequate for the needs of the human organism without the condition being realized. It is for this reason that an air-testing device has been developed by an inventor who has given considerable study to ventilating problems. To all purposes the contrivance is a warning signal that attracts attention to the need of replenishing the air supply in a room. Essentially it is a housed candle that burns with a low-temperature flame. The latter grows feeble or extinguishes itself when the surrounding air becomes deficient in oxygen content. So sensitively is the flame adjusted that it is noticeably affected when several persons enter, and remain for some time in, a closed room where it is burning. In a home or office an occasional brief test of the atmosphere is all that is necessary. It is claimed that if the candle burns with a bright, unfluctuating flame for three minutes, it indicates that the air is not vitiated. Should the flame be a feeble one, however, or extinguish itself, the room is shown to be in need of ventilation.



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## NEW GAS-MEASURING DEVICE FOR CALIBRATING METERS

A recent improvement in the apparatus used for measuring gas, in the calibration of meters and similar work, consists of a device not only simpler but much smaller and lighter than the old so-called "cubic-foot bottle." The new cubic-foot standard, which operates something like a miniature gas holder, is only 25 in. high over all, and when made of aluminum, is quite light. Either water or oil may be used as the sealing liquid, and the whole equipment, liquid and all, may be carried from place to place by one man—an impossibility with the old apparatus. The patented device is that at the right, and has been released to the public.

## HARBOR DEVELOPMENT FOR TERMINUS OF SUEZ CANAL

The belief that Suez, southern terminus of the Suez Canal, will some day become one of the largest oil depots in the Orient seems borne out by the recent grant of several million dollars for a more commodious harbor. The old harbor was inadequate; the new will comprise a wide channel about a mile and a half long, protected by two great breakwaters extending into the Gulf of Suez. Within the breakwaters will be established a filling station to supply the constantly increasing number of oil-burning vessels.

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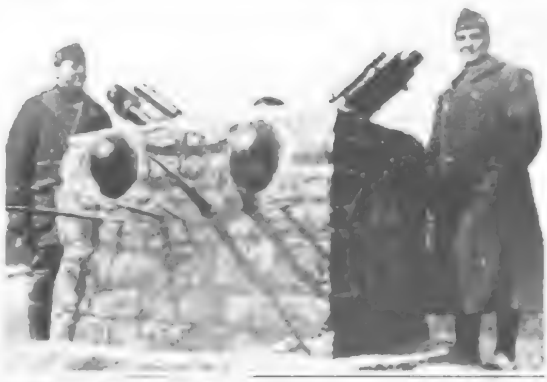
**Future Officers and Crews of the United States Merchant Marine: These Men Are Students in One of the Schools Conducted by the Shipping Board, and Are Ready for a Practice Cruise on the Training Ship "Brookdale"**

## MERCHANT-MARINE STUDENTS MAN TRAINING SHIPS

Practical experience is one of the teachers employed by the Federal merchant-marine training schools to transform men without knowledge of boats and the sea into competent sailors. Students are placed on training ships, and learn their lessons while actually performing the duties of crews on these vessels. Twenty-five thousand recruits have been taught by this method since the establishment of the schools early in 1918. Classroom instruction, given on shore, supplements the practice cruises.

## ARMISTICE-DAY BATTLE LINE MARKED BY CRUDE MONUMENT

A squat stone monument which rises four feet from the soil of France near Stenay will some day hold more interest for American tourists than the Arc de Triomphe, or a dozen others. For this was erected by engineers of the Fifth Army Corps, A. E. F., to mark the high water of America's triumphant advance against the embattled Germans, reached Nov. 11, 1918. There's not another monument like it in the world. Trench mortars and helmets deck the top, bristling bayonets and more helmets adorn the sides. On one side is the pentagonal insigne of the Fifth Corps, worked out in colored stone. The monument rests on an enduring base of concrete.



BY COURTESY OF CHESTER V. SHAFER

**The Two Staff Officers are Standing Proudly by the Odd Monument That Marks the Battle Line of the Fifth Army Corps, A. E. F., on Armistice Day**

¶ By dividing the box body of his motor truck into three sections, with removable partitions, a Nebraska merchant is saving considerable time and expense in delivery. Such commodities as coal, brick, and tile are so loaded that the last delivery is put in first, and the first last.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## AIRPLANE BUILT IN DEFIANCE OF CONVENTIONAL DESIGN

Aeronautical engineers will have to go to school all over again if success attends the trials of an odd airplane recently completed. Thus, while the wings of the conventional airplane extend from the fuselage at right angles, the main wings of this strange machine are built above and parallel with the fuselage. Huge longitudinal fins, propellers driven from within the fuselage, landing wheels at both rear and front, all serve to heighten the bizarre effect. The "ship" is reported unofficially to have been seen in flight above its hangar.

In Side and Three-Quarter View is Shown the Revolutionary Structure of the New Airplane. The Larger Wings Extend Longitudinally Rather Than Transversely

## HARVARD FRESHMEN REQUIRED TO PLAY OUTDOOR GAMES

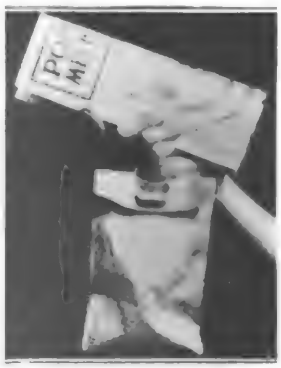
Vanished, at Harvard University, is the old attitude which divided the student body into two camps, composed of those who went in for development above the collar, and those who favored development below the collar. For it is now ruled that every freshman shall participate in some outdoor game for at least three hours each week. After examination by a school physician, the student is given a limited choice which will carry him to the baseball diamond, to the football gridiron, to the wrestling mat, or some other arena of endeavor.

## WORLD-WIDE PICTURE SHOWS TO COMBAT IGNORANCE

Conditions of ignorance, which are so largely responsible for the spread of Bolshevism and the ravages of disease in all quarters of the world, are to be combated by the distribution and display of motion pictures on a tremendous scale. The bureau handling the plan, which has the cooperative support of our government and many others, already has accumulated a grand total of 21,000,000 ft. of film, all of an instructive or inspirational nature. Those who will exhibit these pictures free are able to borrow them without charge. One large commercial-film concern has placed its 76 exchanges, in all parts of the world, at the bureau's disposal, and the pictures will be shown in motor-truck theaters in regions difficult of access, as well as in the factories and halls of civilized industry, for the benefit of all classes of workers.

## HANDLE AND FLAP FASTENER ON PAPER ENVELOPE

A self-sealing paper envelope which has a handle as an integral part was patented recently, and has made its appearance in retail stores, where it is used for small purchases. The handle is formed by the material surrounding a circular hole, large enough to admit a finger, at the flap fold, and a semicircular cut in the flap, about ⅜ in. from the edge of the hole. When the flap is folded over, the handle is available for use. A tab cut in the mouth of the envelope is shaped to serve as a lock when passed through the opening in the flap.



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**HOT-MUD TORRENTS SMOTHER JAVANESE VILLAGES**

PUSHING and tumbling out of this steaming crater, three rivers of boiling mud recently inundated the countryside about Mt. Kloet, one of 22 volcanoes on the island of Java. Following the horrible flood, which crawled over smiling plantations of coffee and rubber, over little villages, and even into the city of Blitar, came a devastating rain of cinders and stones. Two days later the eruption had quieted sufficiently to permit this exploring party to reach the side of the crater, where this photograph was taken. On its return the party reported that 7,000 bodies had already been counted among the chaos.

## MARINE FORESTS BURN DOWN TO LAKE SURFACE

Workers on the Panama Canal whose duties carry them along the shores of Gatun Lake often report strange fires which sweep the inundated jungle. Igniting from some unknown source, possibly by spontaneous combustion, the dead trees and creepers will flare up, and as the flames are carried along the water by the wind, will become the center of a considerable blaze. As the trees are valueless, no one stirs to extinguish the flames which consume the vegetation down to the water's edge and leave protruding only the charred stumps to mark the former forest. The result is the very picture of desolation.

Only These Blackened Stumps Remain above the Surface after the Forest Fires Which Sometimes Burn on Gatun Lake. The White Trees in the Background were Not Touched by the Blaze

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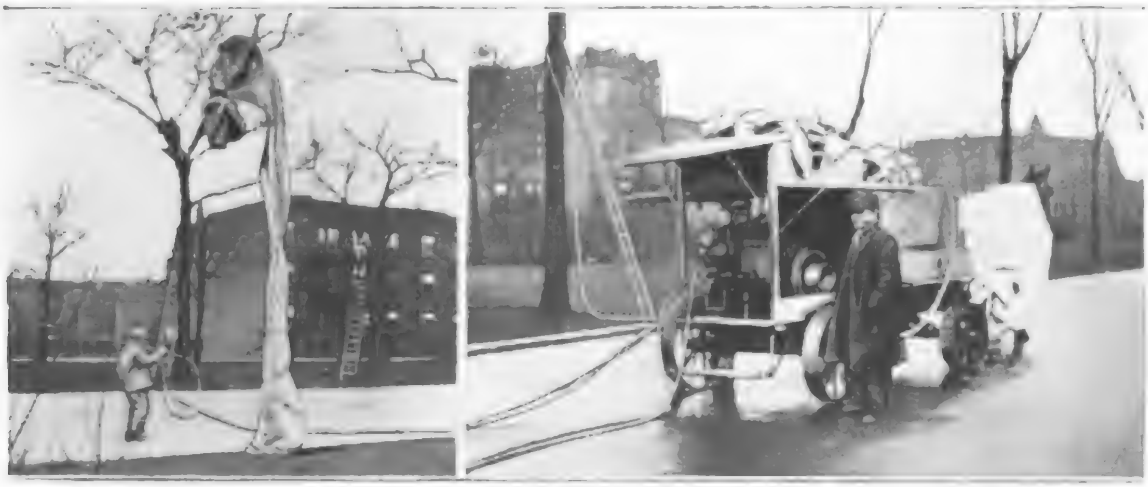


At the Left Is an Ornamental Lamp-Post, Completely Covered by the Spray Protector Used While Spraying Park Trees. The Spraying Machine is Seen at the Right, with Its Gasoline Engine and Pump Just Visible inside the Wagon

## USE ENGINE AND COMPRESSOR FOR SPRAYING PARK TREES

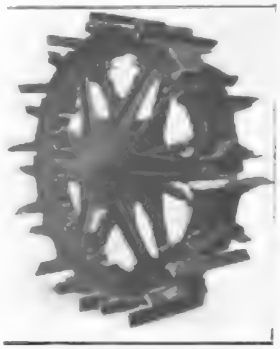
A rather elaborate equipment is used by one of Chicago's park boards for spraying the shade trees of the boulevards and parks, as a protection against insects. In the spraying wagon is an air compressor driven by a gasoline engine, and a constant pressure is automatically maintained in the tank containing the liquid. The air pressure is applied in such a way that the spray is atomized, and its extremely fine particles penetrate to all parts of the foliage without waste. Because of the corrosive effect of the liquid used, it is necessary to cover all lamp-posts within range of the spray, and wrappings for them are carried on the wagon. The wheels are shod with broad steel tires to avoid injury to the pavement.

## HYDROELECTRIC POWER PLANT AT VICTORIA FALLS

The world's greatest cataract soon will be generating electrical energy, according to a recent, supposedly authoritative, announcement, which declares that work on the long-deferred project for erecting a hydroelectric power plant at Victoria Falls, on the Zambezi River, South Africa, will begin in the near future. The scheme has been under consideration since 13 years ago, when a company formed for that purpose was granted permission to build a plant capable of producing 250,000 hp. at the falls. For various reasons construction was postponed. Chief among these was the abundance of cheap coal. Now that mining costs are increasing, interest has been revived in the plan for harnessing the falls. Current probably will be used by the famous Rand gold mines, located some 600 miles from the site of the proposed plant. It is estimated that at least 20 per cent of the power generated at the falls will be lost during transmission this distance. A survey of the falls has been made.

## TRACTOR WHEEL'S IRON PADS PREVENT ROAD DAMAGE

A tractor wheel designed to give maximum traction with minimum road damage, first built by Italian engineers, has now been introduced to the American market. Essentially the traction element consists of a number, usually 12, of flat steel pads, held against the wheel rim by individual coil springs hung from the hub. Each of the pads is fitted with a wedge-shaped flange which enters the rim between rollers, so that there is a roller in each space between adjacent pads. The rollers transmit the driving power to the pads, which are free to follow the inequalities of the road surface as they rock back and forth on the arc of the wheel periphery. Tractors so equipped have hauled as much as 80 tons without road damage.



*Popular Mechanics features will appear in moving pictures issued by Paramou[illegible] Magazine.*

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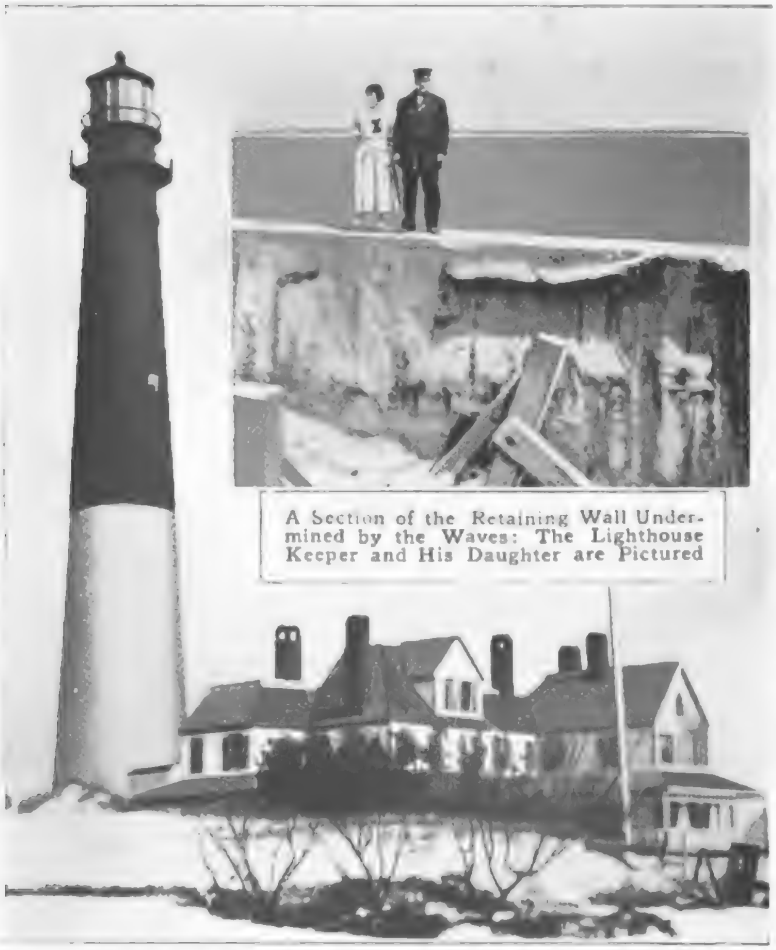
## JETTIES PROTECT OLD LIGHTHOUSE FROM THE SEA

Fortifications to protect the famous old Barnegat lighthouse on the New Jersey coast from the onslaughts of the sea are being constructed in the form of jetties, expected to prevent the washing away of the sand on which the lofty structure stands. Eleventh-hour steps were taken to save the tower after the waves had undermined the retaining wall which surrounds the government reservation on which it is located, and threatened to eat their way under the foundations of the building.

A temporary breakwater of sandbags was built, awaiting the arrival of material for the jetties. One of the latter will extend 200 ft. into the water from one angle of the retaining wall, while another, 75 ft. long, will parallel the first, extending from another angle. Concrete blocks will be used, with a mattress of brush between each course. The piers will be 4 ft. across at the top, 22 ft. through at the base, and will stand 4 ft. above the surface of the water at high tide.

First erected in 1838, the Barnegat lighthouse is one of the best-known signal shafts on the Atlantic coast. It was rebuilt in 1858 in its present form, but is still equipped with an old-style oil lamp.



A Section of the Retaining Wall Undermined by the Waves: The Lighthouse Keeper and His Daughter are Pictured

**Barnegat Lighthouse: Concrete Jetties are being Constructed to Shield the Great Tower from the Sea, Which is Threatening to Sweep the Sand from under Its Foundation. The Keeper's Residence is Shown beside the Lofty Beacon. An Oil-Burning Lamp Provides Light**

## IMPROVE VALPARAISO HARBOR WITH CONCRETE WORKS

Shortage of labor and materials during the war so impeded the contractors engaged in adding extensive improvements to the harbor at Valparaiso, Chile, that three more years will be required to finish the work, though the original plans provided for its completion before 1920. In spite of the difficulties encountered, much has been accomplished and the facilities of the port already have been greatly increased.

Concrete is being used for practically everything connected with the project. This includes a breakwater, 943 ft. long; a quay wall, 2,066 ft. long; a mooring jetty, 820 ft. long and 328 ft. wide; a wharf for coal and other materials, 656 ft. long and 98 ft. wide, and many other large structures.

A novel method was used in constructing the deep-water portion of the enormous breakwater. Sand and quarry rubbish were used to build a mound, to within about 16 ft. of the surface of the water. Reinforced-concrete boxes, 65 ft. long, 20 ft. wide, and 40 ft. deep, were floated over this foundation and sunk, after which they were filled with concrete. Unfilled, the boxes weighed 2,500 tons, and when filled, about 9,000 tons. They were built in a large tempo-

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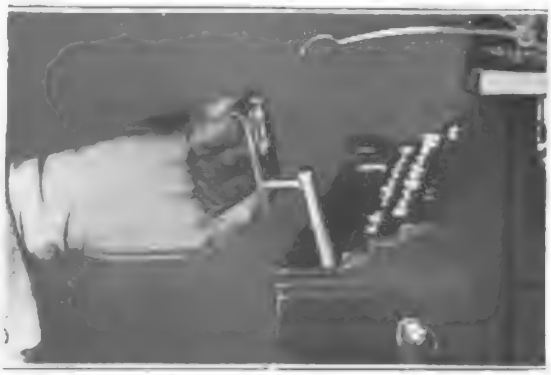
rary dry dock of sheet steel and concrete. A similar method was employed in constructing the jetty.

Proof that the various structures will withstand the action of the waves was obtained during a recent storm, which, though extremely violent and disastrous to shipping, did no damage to the works then completed.

## BLIND AND ARMLESS SOLDIER OPERATES TYPEWRITER

Physically wrecked by their experiences on the battle field, many veterans of the world war have been supplied with substitutes for lost limbs, and trained to employ them with marvelous dexterity. A British soldier who was deprived of his arms and eyesight by the explosion of a defective bomb is an example. Aided by artificial arms and hands, and a simple attachment for one of the latter, he operates a special typewriter with remarkable speed and accuracy. The attachment consists of a rubber-tipped metal bar, bracketed to an adjustable band which is used to fasten the device to an artificial hand. Large square keys distinguish the typewriter from an ordinary writing machine. The handicapped learned his new accomplishment in an army hospital.



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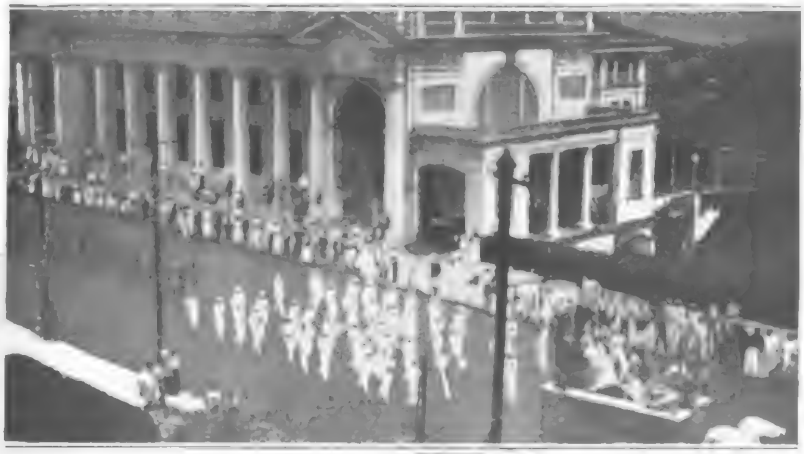
**Device with Which an Armless Blind Soldier Operates a Typewriter: The Machine is Equipped with Large Square Keys**

¶ Plans are being made for harnessing the Paraná River, a large South American stream. A survey of Iguassu Falls is being made by the government of Argentina, with the idea of building a hydro-electric power plant at that point.

## OLDEST NEW WORLD CITY CELEBRATES FOUNDING

Four centuries ago the city of Panama came into existence as the first settlement of Europeans on the western hemisphere, then known as the New World, and recently its present-day citizens celebrated the four-hundredth anniversary of its founding with appropriate ceremonies. Addresses were delivered in the old city, five miles from the present municipality, and parades were held in the new city. The history of Panama includes interesting events, chief



**Parade Passing the New Railroad Station in the Modern City of Panama during the Four-Hundredth Anniversary Celebration Held a Short Time Ago**

**Cathedral Ruins in the Ancient City of Panama: In the Vicinity of This Historic Building the First European Settlement in the New World was Founded Soon after the Discovery of America**

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among them being the construction of the great canal of the same name and the destruction of the city by the buccaneer, Henry Morgan, in 1671. The old city has fallen into decay.

## FIRE STARTED BY LIGHTNING DESTROYS TANK OF OIL

Fifty-five thousand barrels of oil went up in dense clouds of smoke at Dawes, W. Va., recently, after lightning struck

**Blazing Oil in a Large Steel Tank, at Dawes, West Virginia: The Conflagration was Started by a Bolt of Lightning**

a large steel oil tank, setting fire to its highly inflammable contents, which burned fiercely for 24 hours before they were entirely consumed. It is estimated that the loss was nearly $300,000. The costly and spectacular conflagration was viewed at close range by many.

¶ Postage stamps recently issued by Uruguay bear portraits of President Wilson, President Poincairé, and the rulers of other countries which fought against Germany in the world war, including England, Italy, and Belgium.

## AMERICA'S MERCHANT MARINE QUADRUPLED DURING WAR

War's effect on the merchant marine of the United States is told graphically in statistics revealed in the latest edition of "Lloyd's Register of Shipping," the first uncensored issue since the beginning of the war. A comparison of the amount of seagoing steam tonnage flying the flags of various countries before hostilities began and at the present time shows that, in 1914, American steamers had a total gross tonnage of 2,027,000, while the figure for 1919 is 9,773,000 gross tons. This means that the United States now owns more than four times the amount of tonnage in its possession before war began, an increase of 7,746,000 tons, or 382 per cent, in five years. This country now takes second place, formerly held by Germany, in steamship tonnage, the United Kingdom leading with 16,345,000 gross tons, in spite of a war loss of 2,547,000 tons. Japan has added 617,000 gross tons, or over 36 per cent, to its merchant marine, and the fleets of France, Holland, and the British dominions also show some increase, but the fact that the world's shipping came out of the war with a gain of 2,493,000 gross tons since 1914 is obviously and entirely due to the unprecedented shipbuilding activities of this country.

## SWEET POTATOES AND MALT PRODUCE GOOD SIRUP

An extremely simple process produces a good grade of sirup from sweet potatoes and malt, the latter an important item in the manufacture of alcoholic beverages in pre-prohibition days, according to government chemists. The sweet potatoes are boiled until soft and then mashed. When the temperature of this mass is 140° F., a quantity of ground malt, equal to 3½ per cent of the weight of the uncooked potatoes, is added, and the mixture is allowed to stand for a few minutes. Heat is then applied, and the substance is stirred constantly until it reaches a temperature of 150° F., when it is removed from the fire and allowed to stand for an hour. During this time it is stirred occasionally. Juice is extracted from the pulp by placing it in cloth bags and applying pressure. By boiling this juice, sirup is obtained. No special apparatus is necessary for the production of the sirup, ordinary kitchen utensils being suitable. Its cost is extremely low.

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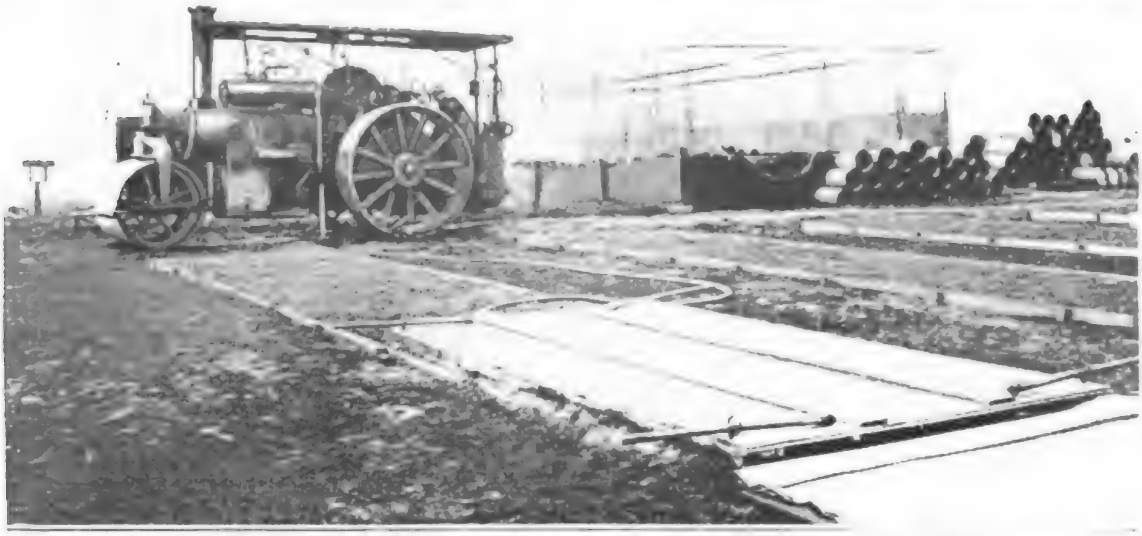


Sterilizing a Tobacco-Plant Bed with a Steam Road Roller: In the Foreground Is One of the Beds, Tightly Covered. The Machine Cooks the Soil with Steam Carried to the Bed through a Hose

## UTILIZE STEAM ROAD ROLLER TO STERILIZE SOIL

Great care must be exercised by tobacco-plant growers in the preparation of beds for producing the sets. The destruction of weed seeds and insect larvæ is highly important, as the plants are easily handicapped during their early stages of development. It has been a common custom to build fires on the beds for this purpose. Recently steam has been used. An eastern grower uses a steam road roller, transferring hot vapor from the boiler of the machine to the beds with a hose. Tight covers are placed over the beds while the sterilization is in progress, and a temperature of 212° F. is maintained for two hours.

## WILD FOWL DIE FROM DIET OF STRAY SHOT

Thousands of wild ducks and other waterfowl die each year from lead poisoning, incurred by eating stray shot picked out of the mud about popular shooting grounds. Many ducks recover from the malady, it is true, but even these are permanently injured. Females mated with affected males lay many infertile eggs, mingled with others which produce puny young. The affection is, of course, a result of the fowls' habit of swallowing small, hard objects to furnish grit for the gizzard. Here the little lead pellets are ground away, to pass into the intestines, where they produce progressive paralysis and, usually, death.

## FLOOR-MOPPING CONVENIENCE IS TANK ON WHEELS

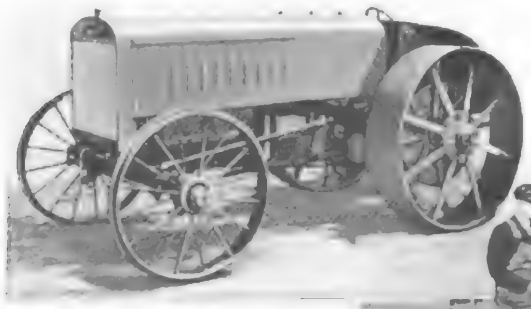
New labor-saving devices appear on the market almost daily, and but few lines of work have escaped the attention of inventors. At last the commonplace floor mop and its wielder have been noticed, with the result that another convenience is now for sale. It is a metal tank for suds, mounted on three rubber-tired wheels, and equipped with a wringer, a receptacle for soap or washing powder, and a drain valve. Being painted in white and black, the truck is far from unsightly.

Wheeled Tank for Floor Mopping: It is Equipped with a Wringer, a Compartment for Soap or Washing Powder, and a Drain Valve

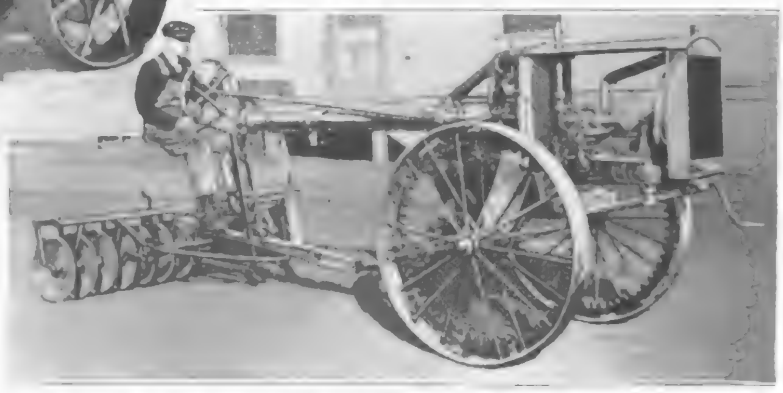
*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

## SIMPLE TWO-WHEEL TRACTOR REPLACES FOUR-HORSE TEAM

A tractor that can be relied upon to do the work of a good four-horse team, useful from planting time through all the operations of disking, harrowing, cultivating, and harvesting, fits most conveniently into general farm work. For such a machine a large Wisconsin manufacturer has adopted the two-wheel model. Driven by a 6 to 12-hp., four-cylinder engine, the machine develops a drawbar pull of 1,000 lb., and, when used with a 16-in. plow, can handle a small disk and smoothing harrow, or similar attachment, at the same time. A heavier model, designed to pull three or four plows, has an 18 to 30-hp. engine and four wheels. It has 50-in. drivewheels with 12-in. face, and travels at two speeds, 2.3 and 2.8 miles an hour, with one speed reverse. It exerts 3,000 to 4,000 lb. of drawbar pull.



Heavier Four-Wheel Tractor of the Same General Type as the Light Model at the Right, Giving 3,000 to 4,000-Pound Drawbar Pull



Two-Wheel Tractor That Takes the Place of a Four-Horse Team for General Farm Work, and Is Useful from Planting to Harvesting. It Develops Up to 12 Horsepower and a 1,000-Pound Drawbar Pull

## NEW SPARE-TIRE CARRIERS ATTACH WITHOUT TOOLS

Spare-tire carriers which can be attached without tools are a lately introduced automobile accessory. One consists of two metal forms, shaped to fit over the tread of a casing, that are joined by strips of metal. When one of the forms is placed on top of the extra tire carried in the regular iron at the rear of a car, the other becomes a cradle for an additional tire. Another device includes two tire-fitting forms, to each one of which are bolted two hooks. In applying this carrier, one of the forms is placed on top of the already attached spare tire, with the hooks protruding, and the other is hung below it by means of the hooks.

Two Forms of Tire Carrier for Extra Spare Tires: In Both, the Spare Already Attached Supports the Carrier for the Extras

## NEW FOODS BEING EVOLVED BY AMERICAN CHEMISTS

The menu card prepared by science is constantly growing longer, and the next generation no doubt will discuss delicacies wholly unknown to the present. Among the curious things that American chemists are now experimenting with are edible oils from such sources as tomato seeds and cockleburs. A new product that promises great usefulness is an ice-creamlike paste prepared by condensing buttermilk. Bread made with this substance browns beautifully at low heat because of the sugar of milk it contains, which also gives it a pleasing flavor and a substantial quality. Beans and peas that have sprouted, as well as grains in the same condition, are found to make excellent food—a fact long known to the Chinese, who use them, flavored with meat, to make stews.

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# THE PARROT AND COCKATOO INDUSTRY OF CALIFORNIA

By JOHN EDWIN HOGG

The "Jungle" Cage in the Parrot Brooders Is an Imitation of a Bit of Tropical Wilderness, Whose Temperature is Maintained at 110 and the Humidity Kept High by Sprays of Water on the Sand Floor

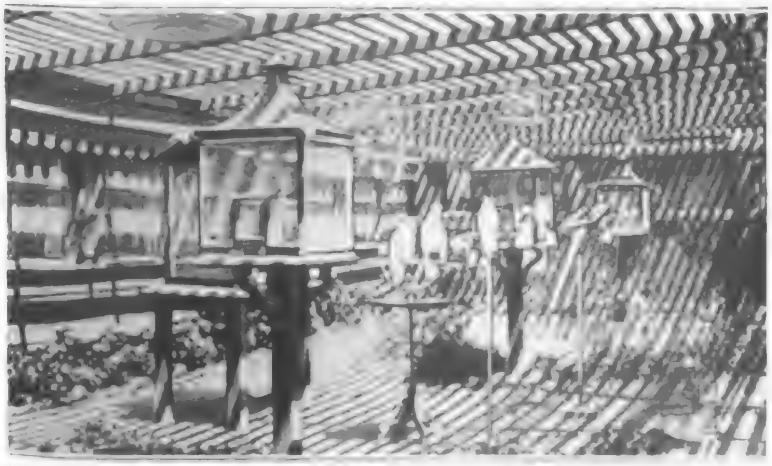
BEFORE the war, the United States imported parrots and other birds of the family to the value of approximately $1,000,000 each year. Most of the cockatoos came from Australia, while parrots and parrakeets were brought by thousands from Africa, Mexico, South and Central America, and also from the Isle of Pines, near Cuba. A few were shipped from Borneo and Java. Naturally the war shortage of shipping terminated these shipments, and old birds with vocabularies of from 75 to 100 words became almost priceless. Few were to be had at any price.

About the time the scarcity of feathered talkers reached its height, some one recalled that parrots in captivity had been known to lay an occasional egg. The dealers began to open their eyes. Then they proceeded to develop a brand-new American industry, which bids fair to do away with the importation of birds of the parrot family, by raising them in captivity, like ostriches, or barnyard stock.

Baby Sulphur-Crested Cockatoo, Asserted to be the First One Successfully Hatched and Raised in America

About the only requirement for raising parrots and cockatoos in certain sections of the United States is to know something of their habits and to create artificially conditions similar to their native environment. An abundance of fresh fruit is essential as well as a climate with high temperatures and with shade. Southern California offers more nearly these conditions than any other portion of the United States, except for its hot days and cold nights. Accordingly the parrot brooders are sun-heated in the daytime, and electrically heated at night.

The first attempts to produce a domestic supply of parrots and cockatoos were made with incubators. This was unsuccessful. The eggs hatched, but the baby birds perished for lack of mother's care in feeding them, all young birds of the parrot family being fed from the parent bird's crop, like doves or pigeons. Efforts were made to feed the incubator-hatched birds by hand, but to raise a single parrot by this method almost required the services of a special nurse. Setting parrots and cockatoos were then tried, and with greater success. The nesting room is virtually an artificial jungle in which the temperature is kept at 110° F. Humidity is maintained by numerous tiny spray pipes that



Parrots and Cockatoos Hatched in the "Jungle" Cage are Transferred Later to the "Acclimatization" Cages, and in from Three to Six Weeks the Feathered Pets become Accustomed to the Temperate Zone



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Baby Parrots Learning to Climb Trees and Bushes, in a Special Cage Room to Which They are Transferred from the Brooders

discharge onto the sand floor upon which the birds make their nests.

Obviously birds reared under such conditions cannot be transferred to a cage and shipped to a purchaser without dying or at least suffering serious injury to their health. Accordingly they are moved to the acclimating room. This is another greenhouselike structure, and there the temperature is gradually reduced. In from three to six weeks the little feathered pets become accustomed to climatic conditions similar to those of the average family piazza. They are then ready for shipment.

Several aviaries are now in operation where all the well-known varieties of talking parrots are being domestically reared, large macaws, cockatoos, and parrakeets.

As with everything else, the market-price of parrots is dependent upon quality. Their value increases with their vocabulary, and their ability to whistle and do tricks. Similarly a parrot that speaks Spanish or French commands a higher price from a prospective purchaser of either nationality. The bird producers have not been slow in recognizing this, so in connection with nearly every aviary there is a school with a competent trainer. Here parrots and cockatoos are taught to talk, sing, and whistle and go through all manner of antics to increase their value.

Cockatoo's Nest, a Shallow Pit in the Sand, Lined with Sticks, and Located under the Thickest Foliage That can be Found

Considering the progress made in less than two years, most of the aviarists are of the opinion that very soon the nation's entire supply of such birds will be domestically produced, and importation will be eliminated.

Though Electrically Heated at Night, the Sun Warms the Parrot Brooders during the Day, and to That End They are Built Like Greenhouses. The Square Boxes on the Lawn Are Feeding Cages for the Young Birds

and at a considerable saving over the expense of importing the same birds even if such importations had been possible. Not only have these aviaries succeeded in producing parrots, but they have been equally successful in the raising of the

## MEDICAL-CORPS HISTORY IN PHOTOGRAPHS

Thanks to the skill and daring of the army photographer, the Medical Corps of the United States Army will not soon forget the grim lessons learned in the recent war. Approximately 10,000 still pictures and more than 14 miles of motion-picture film have been collected and systematically filed as a pictorial record of all Medical Corps activity overseas. Some photographs depict actual battle conditions. The field, evacuation, and base-hospital scenes are instructive.

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## LATEST STYLE OF PENMANSHIP REVIVAL OF ANCIENT ART

In the interest of legibility, practically lost sight of in the handwriting of the times, a style of penmanship new at least to this generation is being introduced in the schools of Great Britain, and promises to invade America. It is virtually a reproduction of the "print-writing" common in the 15th century. Its characters, formed with a stub or letterers' pen, are almost typelike in form, except that they are made at a slight angle and with no attempt at ornament. The main line of each letter is made heavy, and the letters are formed close together, but without connecting lines. Observers state that the school children are taking kindly to the easy and positive style of the new writing, and that it seems destined to succeed all the inefficient systems now employed.

## WAR RECORD OF FRATERNITY PRESERVED ON HELMET

Instead of the conventional service flag, the members of a college fraternity use a captured German helmet, properly embellished, as a memorial to the men of the organization who served in the armed forces of the country during the war. The emblem of the order, fashioned in gold, is fastened at the center of the crown of the steel hat. Surrounding this are the names of three members who died in service, engraved on raised gold scrolls, while on the sides of the crown are carved the names of living ex-service men.

## MOTOR-TRUCK ATTACHMENT FOR MAKING ROADS

Motor trucks can be converted into road-making machines at little expense by a recently patented attachment, designed especially for the lighter types of gasoline-driven vehicles. A scraper is suspended underneath a truck, when the device is used, on a frame which is connected with levers pivoted on a standard mounted on the floor above. By moving the levers, the scraper is adjusted to several positions for grading and leveling, or raised to clear the ground. Two men are required to operate the machine, one for driving and the other for manipulating the levers.

**A Light Automobile Made into a Road-Making Machine: The Change was Brought About by Converting the Car into a Truck; Then Attaching a Device with Suspended Scraper and Levers for Adjusting It**

## ICELAND, LAND OF WONDERS, BEARS MISLEADING NAME

Even among well-informed people, the impression prevails that Iceland is a bleak, sterile, and forbidding land—a conception for which the name, doubtless, is wholly responsible. Attention focused on the big north-Atlantic island by its recent acquisition of full sovereignty has succeeded in partly dispelling its undeserved reputation. Its scenic charm is extraordinary, presenting all the wonders of glaciers and geysers, volcanoes and waterfalls, salmon rivers and mineral springs, on an unusual scale. Its history demonstrates the success of its parliamentary form of government, and reveals a remarkable literature that flourished in the 12th and 13th centuries, and still holds its influence over a population of 85,000.

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## INFLATABLE SWIMMING SUIT DOES NOT HAMPER WEARER

Common faults of pneumatic floating devices for swimmers, such as bulkiness, clumsy appearance, and interference with

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**Pneumatic Bathing Suit: How the Blouse is Inflated is Shown at the Left. The Garment does Not Hamper the Movements of a Swimmer**

the movements of the arms and legs, are declared to be absent from a new inflatable bathing suit, though the garment is capable of supporting its wearer in the water indefinitely. The upper portion, or blouse, of the suit is made of two thicknesses of rubber-impregnated cloth, the edges of which are fastened together to form an air-tight bag. A tube in the front of the blouse permits inflation after the suit is donned. In style, the costume is similar to ordinary bathing suits.

## HOW ITALIANS SUNK AUSTRIAN SHIPS FINALLY DISCLOSED

The remarkable mechanism by which two Italian officers, with a courage still more remarkable, sunk the Austrian flagship "Viribus Unitis" and the liner "Wien" in the harbor of Pola has finally been disclosed. Major Rosetti of the Italian navy had constructed a floating torpedo of the usual shape, the head of which was composed of two detachable mines filled with about 350 lb. of "TNT" apiece. These mines could be attached to a ship's skin at any desired depth, and were exploded by clockwork. A small compressed-air engine in the rear drove the torpedo for several hours at slow speed, and it was steered by the hands of the operators, who lay astride of it.

The naval officer was joined by Surgeon Sub-Lieutenant Paolucci, who had intended to swim into the harbor with a mine. For four months the men practiced passing all manner of obstacles with the torpedo. They discovered that injections of camphor greatly increased their ability to resist the cold water, and clothed themselves in light water-tight garments which exposed only their faces. At 10 o'clock in the night of Oct. 31, 1918, they started on their heroic mission. By 3 a. m. they had passed the external barrage, the harbor gate, and two inner barricades, paddling much of the way, against the tide, to avoid the sentry's eye. At about 5:00, Rosetti swam some 120 feet to the battleship, set the mine for 6:30, and returned. But it was now getting light; reveille sounded, and the men were discovered. Hastily setting the second mine, they started, submerging the torpedo. While the Austrians were discussing the most suitable fate for the prisoners, the flagship blew up and sank, followed by the big liner. A few days later the Italian navy entered Pola.

## MISSPELLED SIGN INCREASES TRADE OF FRENCH CAFÉ

Bidding for the trade of English-speaking visitors in the city, the proprietor of a café in Le Havre, France, took some startling liberties with the language of his prospective patrons when he placed a sign over his windows not long ago. In spite of the fact that the legend reads "Legue Off Nations," it was understood, and many friends of the league-of-nations plan became his customers.

**A Frenchman's Spelling of League of Nations: In Spite of the Mistakes, This Sign Attracted English-Speaking Patrons to a Café in Le Havre, France**

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# NO SHIPS TOO LARGE FOR PANAMA CANAL SHOPS

View of the Balboa Dry Dock, Looking West: In It Are a Steamer, a Tugboat, and the United States Ship "Rhode Island." The United States Transport "Von Steubob," Damaged at Sea Just Prior to the Halifax Disaster, was Routed to the Balboa Dry Dock for Needed Repairs, Which were Completed in Record-Breaking Time

So tremendous and so active an engineering enterprise as the Panama Canal must necessarily have a great workshop. The big shops which handle the repair work of the canal are situated at Balboa, on the Pacific end, and are peculiar in that, while strictly government properties, they are prepared to execute any private steamship or railroad repair work that may be required. The mammoth dry dock is over 1,000 ft. long, 113 ft. wide at the floor, and 143 ft. at the coping, with a depth at mean low water of 29.3 ft., enabling it to handle with ease the largest ships afloat. The dock is of concrete on solid rock, the gates being practically the same as those of the canal locks.

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The Mammoth Size of the New Balboa Dry Dock, Which Is Over 1,000 Feet Long, may be Better Realized from This Bird's-Eye View, in Which is Seen a Seagoing Vessel of Ordinary Size Undergoing Repairs. The Big Workshops of the Panama Canal are Seen at the Right of the Dry Dock. The Whole Plant Is Able to Handle the Largest Ship Afloat

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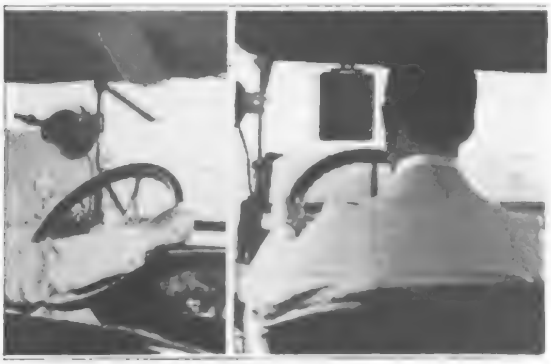
## EYES OF AUTOMOBILE DRIVER PROTECTED BY SHIELD

Similar in principle to many other devices intended to prevent the temporary blinding of automobile drivers by the headlights of approaching cars, a contrivance recently invented by an eastern dentist is declared to be as effective as it is simple. A small sheet of metal is hinged to a clip that fastens to the top edge of an ordinary windshield in front of the driver's seat. Lowered, the plate shields the eyes of the driver from glare, but does not interfere with a view of the road. It can be folded up for daytime driving.



Attached to the Top of the Windshield, a Small Metal Plate, When Lowered, Shields the Eyes of an Automobile Driver from the Glare of Approaching Headlights

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¶A cooked-food center, from which housewives can obtain complete meals ready to serve to the family, is a civic novelty boasted by the city of Buffalo, N. Y. The home-demonstration agent of the U. S. Department of Agriculture, the State College of Agriculture, and the Buffalo Home Bureau coöperate in handling the work.

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## ROADSIDE CAMPING OUTFIT FOR AUTO TOURISTS

Roadside camping is rendered comfortable by an outfit constructed at home by a western motorist for use when touring. As most of the equipment is carried on the running boards of a car, it does not mar the pleasure of traveling by crowding the occupants. Included in the conveniences are a bed, two cupboards, and a table. The bed consists of a wide strip of canvas, fastened to a roller on a running board, and a collapsible frame in which the cloth can be stretched by turning the roller. Legs support the frame at the end opposite the running board. The cupboards are placed on the other side of the car. When opened, the door of one cupboard forms a table. Food, table and cooking utensils, and other supplies can be stowed in the drawers of the cupboards. An ice box is included in the equipment.

This Picture Shows the Canvas Bed Extended, Ready for Use, in Its Collapsible Frame

A Roadside Meal: Here the Door of One of the Running-Board Cupboards is Serving as a Dining Table for the Inventor of the Automobile Camping Outfit and His Family

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Ice-Lined Caves in Northeastern Iowa: At the Left Is the Entrance from Which a Current of Chilled Air Pours Constantly, Even in the Hottest Weather. Picnic Parties Gather on This Spot and Freeze Ice Cream, Using Ice Obtained from the Natural Refrigerator. Above Is a View of the Cave's Interior, Showing How the Walls are Perpetually Covered with a Coating of Ice

## STRANGE ICE-LINED CAVERNS IN NORTHEASTERN IOWA

Primitive cold-storage cellars were provided by nature for the aborigines of northeastern Iowa long before the advent of the white race in that part of the country, and are still in existence, furnishing a puzzling problem for scientists who attempt to explain their formation. Briefly described, the refrigerated chambers are two ice-lined caves of undetermined size, in which the temperature is near the freezing point, even in the hottest weather. Fresh venison was stored in the cold caverns by the Indians in pre-pioneer times, and nowadays picnic parties freeze ice cream at their entrances, using ice chipped from the walls. The caves never have been thoroughly explored, but are believed to be extensive.

## MEMORIAL BUILDINGS PLANNED FOR WORLD-WAR VETERANS

Instead of monuments of no practical value as memorials to local men who served in the world war, many communities will erect buildings of civic utility. Some of these will be in the form of community houses, in which there will be provided facilities for public recreational and social affairs. Other structures will be used for hospitals, libraries, schools, auditoriums, municipal offices, and other purposes. A campaign is in progress to encourage the choosing of the building type of memorial.

## SWERVING MOTOR CAR WRECKS SPAN OF WOODEN BRIDGE

Freakishly swerving from one side to another of a wooden bridge over a small stream on the Pacific coast, an unmanageable automobile recently demolished the supporting trusses of one span, and caused that portion of the structure to collapse entirely. Though the car was twice on the very edge of the flooring, miraculously it did not leave the bridge. None of the occupants was injured, but the machine was badly damaged. When the vehicle came to a stop after the accident, it was nearly across the wrecked span, and stood diagonally across the roadway. How and why the automobile became unmanageable was not apparent.

Span of a Wooden Bridge That Collapsed After Its Supporting Trusses were Torn Off by an Unmanageable Automobile, Which, Though It Ran So Wildly Amuck, did Not Plunge Off the Bridge

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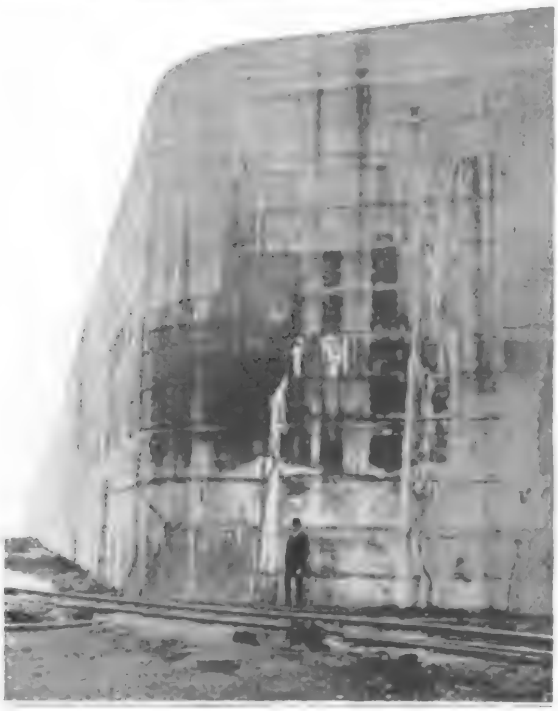
## ENORMOUS DOCK CONSTRUCTED IN CITY OF LONDON

London became a city of importance centuries ago, but it was not until recently that steps were taken to make



The Largest Vessel Afloat can be Accommodated in This Enormous Concrete Dock, Recently Constructed in London

the metropolis a real port, though proper berths for large ships have been practically the only deficiency. A huge concrete dock has just been completed near the heart of the ancient city, big enough to accommodate the most gigantic vessel, and within the near future any craft, regardless of size, will be able to discharge and load cargo within the world's most populous municipality. In the past the larger ships have docked at Tilbury, 26 miles down the Thames River.

## PLAN TO RAISE GALVESTON OUT OF FLOOD REACH

Still haunted by memories of the terrible flood of 1900, the city of Galveston, Tex., aided by U. S. engineers, is planning increased protection against the aggressions of the gulf seas. The most ambitious project is to raise the grade of the whole city by a uniform fill of eight feet, which would cost, it is estimated, some $15,000,000. The alternative plan would raise only the business district from 10 to 14½ ft., the difference being for drainage. This, it is thought, would cost but $5,000,000. Complete surveys are now under way.

## FAMOUS CANADA TROUT STREAM TO BE HYDROELECTRIFIED

The hydroelectric invasion of Canada's romantic wilds grows apace. Now the project is to build a huge turbine plant on one of the world's most famous trout waters—the turbulent Nipigon River. This short stream, whose source, in Lake Nipigon, Ontario, is only 32 miles from its mouth, nevertheless is Lake Superior's largest tributary, and drops several hundred feet in its brief course. The plans, already under way, call for two 12,000-hp., 12,000-volt units at Cameron's Pool, below lakes Maria and Jessie, where a 65-ft. fall is available. A regulating dam will be installed to make reservoirs of the two lakes.

## HOLLOW KEEL CARRIES SHIP'S MOTOR AND PROPELLERS

A hollow fin, which is applied to the bottom of a boat hull in place of a keel, and contains the driving motor, shaft, and propellers, forms the subject of a patent recently assigned to an eastern boat-building concern. The propeller may be located at the end of the main fin, or two or more auxiliary side fins may be fitted with a propeller apiece, their shafts driven by gears or chains from the motor shaft. Such a removable fin or hollow

Side, Bottom, Stern, and Bow Views, Showing How the Hollow Fin Containing Motor and Propellers is Attached

keel, containing the entire motive equipment of a boat, may thus be applied to any hull desired.

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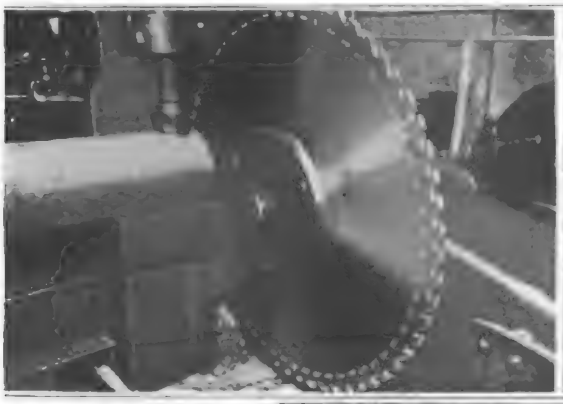
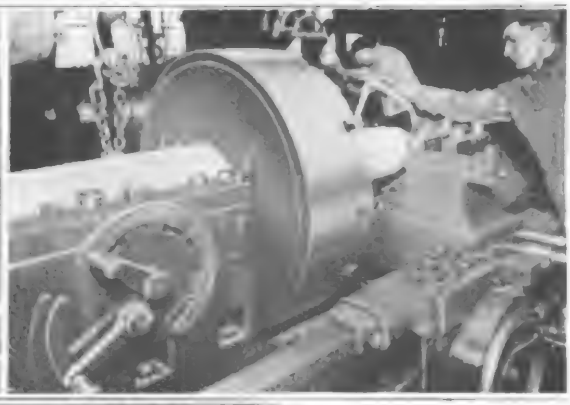
# MODERN MECHANICAL WIZARD IS HIGH-SPEED STEEL

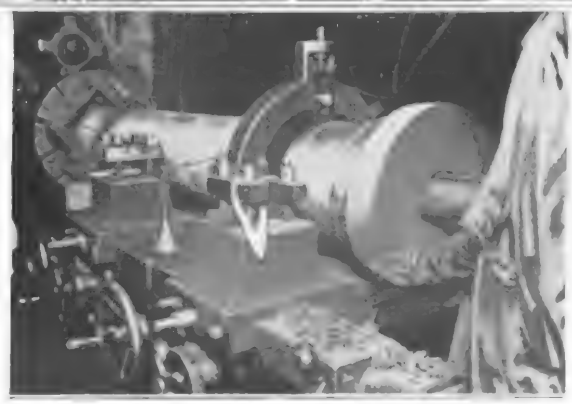


The Inserted Cutters of This 42-Inch Saw Are of High-Speed Steel, Nine-Sixteenths Inch Wide. The Bar being Cut Is Steel, 11 Inches in Diameter, and the Saw Goes Through an Inch a Minute



Here Is a Turning Operation on a Geared-Head Lathe, Running at 36 Revolutions per Minute. The Tool is Set to Cut One Inch Deep, Reducing the Diameter Two Inches at a Cut

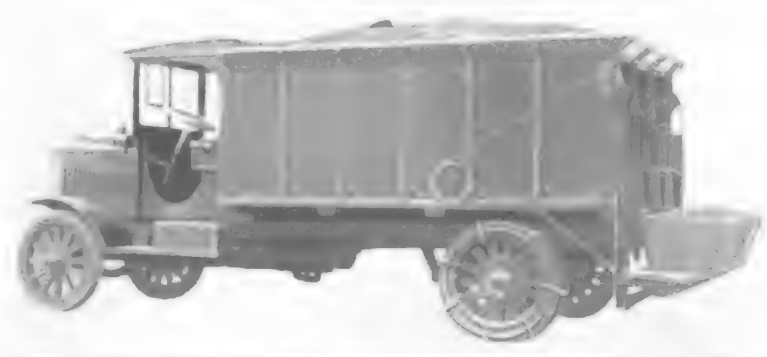
Tools made of high-speed steel have such extraordinary capacity for eating into solid metal that their action is a perpetual novelty. In turning a shaft of silicon-carbon steel, for example, the tool is set for a cut of one inch, reducing the diameter two inches, and advances ⅛ in. at each revolution. A 42-in. saw with inserted cutters penetrates an 11-in. hard-steel bar an inch a minute. A hydraulic-press cylinder is bored in three cuts from the solid, with a hole 7 ft. deep and 9⅝ in. in diameter.



A Hydraulic-Press Cylinder being Bored from the Solid in Three Cuts Seven Feet Deep: The First Cut Makes a Hole Five Inches in Diameter, the Second Cut Enlarges It to Eight Inches, and the Third to Nine and Five-Eighths Inches. A Hog-Nosed Bit of High-Speed Steel on a Long Bar is Used without Lubricant, a Jet of Compressed Air Freeing the Cutter of Chips. At 10 Revolutions Per Minute the Feed Is Seven Thirty-Seconds Inch a Minute

# TRUCK PLATFORM ELEVATES COAL BASKETS

Numerous mechanical arrangements have been devised for the easy unloading of coal trucks, but few of them consider particularly the comfort or convenience of the "carry-in" man. A new form of truck has an elevator platform at the rear, on which the carrying baskets are placed. When the tail gate is lifted, the coal, which rests on an inclined false bottom, slides into the baskets. A power winch then hoists the platform to the height of a man's shoulder, and the carrier simply steps under a basket and walks away with it. This saves a great deal of muscular effort.



The Platform at the Rear of the Truck is Hoisted by a Power Winch Until the Baskets of Coal Are Level with the Shoulder of the "Carry-In" Man, Relieving the Strain of Lifting. The Coal Rests on an Inclined False Bottom, and Slides into the Baskets

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## COMPACT FRUIT-DRYING SET GIVES HOME EMPLOYMENT

An enterprising English concern, in establishing a market for its patented fruit-drying outfit, has been the means of giving home employment to a number of discharged soldiers. The set consists of an evaporating cabinet with sliding trays for the fruit, and a closed receptacle for steaming. The home worker who buys it is able to dispose of the product through a central market operated for that purpose. A course of instruction accompanies the outfit.

The Fruit-Evaporating Cabinet at the Left with Its Sliding Trays for the Fruit and the Steaming Receptacle on the Stove at the Right Make a Compact Set for Home Work

## YANKS THROW PONTOON BRIDGE OVER RHINE IN RECORD TIME

It is recorded that a German regiment of engineers once threw a pontoon bridge across the Rhine in one hour and 30 minutes—which is very creditable when it is remembered that they had been in training for only 40 years. Unfortunately, however, the 2nd Regiment of Engineers, A. E. F., later found at their disposal both the German pontoon equipment and the river Rhine. So they decided to beat the German record. Working at double time, the citizen-soldiers completed the job in 50½ minutes. This world's record was established at Hönningen, just a few miles north of Coblenz.

These Aerial Photographs of the River Rhine Show the Pontoon Bridge Thrown Across by American Army Engineers in the Record Time of 50½ Minutes. Not One Mishap or Delay Marred the Splendid Performance. The Smaller Photograph, Taken a Few Minutes after the Starting Signal, Shows the Pontoons Drifting into Position, Beams and Planks Dropping Swiftly into Place

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## FIRST-AID METHODS FOR AUTO EXHAUST-GAS POISONING

Recognizing the serious and often unsuspected danger of carbon-monoxide poisoning that confronts those who run automobile engines in confined spaces, the U. S. Bureau of Mines emphasizes the importance of prompt attention to victims of this insidious gas. Fresh air is the first requirement for the unconscious patient, and oxygen should be administered if available, but no delay is permissible. Approved methods of artificial respiration should immediately be applied, if natural has ceased, and continued for at least three hours, as the blood cannot absorb oxygen until emptied of carbon monoxide. Hot-water bottles, or substitutes, and warm covers should be used, but no liquids should be placed in the mouth until consciousness is fully restored. The patient should be kept in a horizontal position, and moved only with a stretcher. Sitting or standing may cause a relapse, possibly fatal. It should be remembered that carbon monoxide is odorless, and gives no warning of its presence.

## ENORMOUS MILLING MACHINE IS FINE PRECISION TOOL

A vertical milling machine of enormous size, recently built in Massachusetts for die-sinking work, is remarkable for its fine feeds, operating to .002 or .003 in. The machine has an over-all working surface

**Huge Vertical Milling Machine, Approximately 10 Feet High and Weighing 18,000 Pounds, Which Works to Thousandths of an Inch: The Telescopic Screws Supporting the Knee, or Bed, are Power-Operated**

110 by 20 in., its table surface being 96 by 20 in. Its approximate height is 10 ft. and its weight over 18,000 lb. The knee, or adjustable bed, is supported by two large telescopic screws, one at each end, which are driven in unison by power, controlled by a handwheel in front. The heavy 96-in. saddle bears on the knee at three points, center and ends, giving great rigidity. The machine is driven by a 10-hp. electric motor, mounted on a bracket at the rear of the machine and belted to the milling head, and all controls are so located that the operator can reach them from the best position for watching the work.

## GEOLOGISTS SAY OCEAN'S AGE IS NEAR NINETY MILLION

Though scientists differ by a few million years in their estimates of the ocean's age, their figures really vary not more than 10 per cent, the average, as lately announced, being rather more than 90,000,000 years. The use of the word "estimate" is apt to obscure the fact that the calculations are wholly mathematical, and based upon carefully studied data. It is known that the saline constituents of the sea are deposits continuously being made by the rivers, and that the ocean, therefore, constantly grows more salty. Since tests have been made which give the figures for the amount of saline material carried by the streams, their annual burden of salt is merely divided into the amount now in the ocean.

¶ Hose pipe intended for trench use, made of rubber-impregnated canvas reinforced with iron wire, is being salvaged by the hundreds of miles in England. A special machine dismembers the hose, and the iron brings about $60 a ton, while the canvas goes to make cellulose after the rubber is reclaimed.

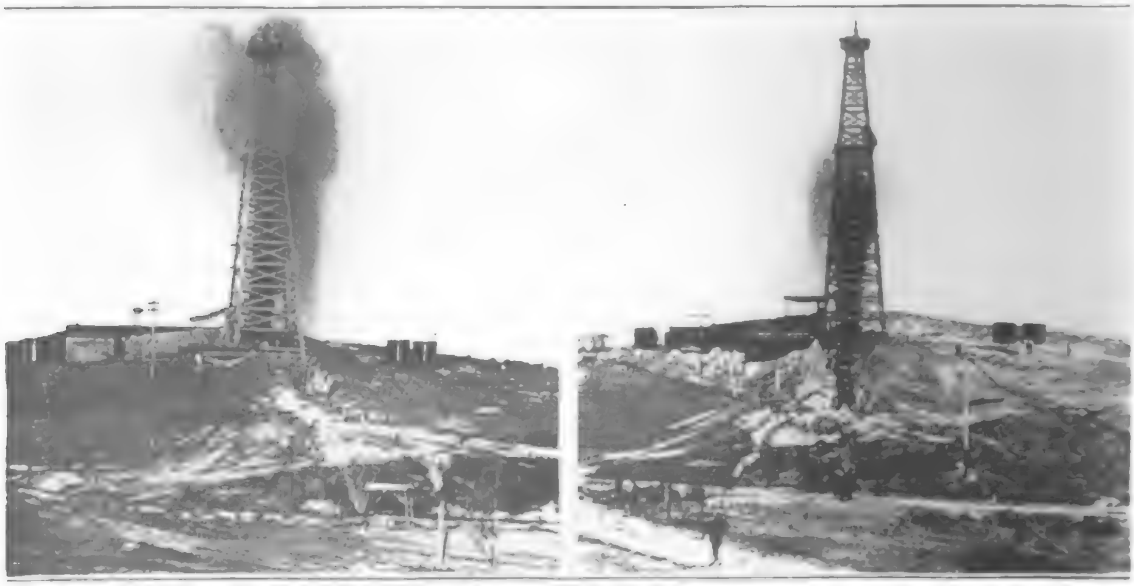
## PUMP WATER FOR IRRIGATION WITH GASOLINE ENGINE

A voyager on Okanagan Lake, in the mountains of British Columbia, approaching a lonely shore; well might register surprise on finding a gasoline engine pounding away unattended at its task of driving a three-plunger force pump. It is an expensive method of irrigating, but the only one available to the farmers on the high plateau, 150 ft. above the lake. The intake is 40 ft. out in the lake, and the water is delivered through a two-inch pipe buried six inches in the bank. The rainfall of the region is only 10 in. a year, but with the pump supplying ample water, remarkable crops of fruit and vegetables are raised, a single garden patch not infrequently yielding peaches, apples, melons, potatoes, and corn.

Three-Plunger Force Pump, Driven by Gasoline Engine, Used to Supply Water for Irrigating a Farm at the Top of the High Bank in the Background

## THROTTLE GUSHING OIL WELL AFTER SIX-DAY STRUGGLE

Impelled by some unexplained subterranean force, a four-months-old oil well at Whittier, Calif., without warning increased its theretofore steady rate of flow from 500 to 8,000 bbl. daily, not long ago, with the result that a vast quantity of oil was lost before the torrent could be throttled. The gushing began so suddenly that it was impossible to reach the regulating valve, located in a pit at the mouth of the well, before the excavation was filled. Oil shot up 70 ft. at first, but after the pit had been drained the unimpeded stream mounted higher than the top of the 112-ft. derrick over the well. Spray from the tremendous column was carried as far as 10 miles from the scene by the wind. Six days after the gushing began, workmen succeeded in fastening a 40-ft. pipe across the end of the well casing, retarding the flow of oil to such an extent that soon afterward the well was brought under complete control.



For Four Months After It was Drilled, the Oil Well Pictured Here Produced 500 Barrels Daily. Then It Suddenly Began to Gush, Pouring Out 8,000 Barrels in 24 Hours. Six Days were Required to Throttle the Increased Flow

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GREAT CONCRETE VESSEL LEAVES WAYS AT SOUTHERN SHIPYARD

EXPERIMENTS are no longer necessary to prove the worth of the concrete ship. In repeated trials it has vindicated the claims of its friends and refuted the slander of its enemies. The vessels have shown themselves to be stanch and seaworthy, capable of weathering any storm, and possessed of many desirable qualities not found in craft of steel or wood. Another addition to the growing number of these modern marine productions was made recently when the hull of the giant steamship "Latham" was launched successfully at Mobile, Ala., for the Emergency Fleet Corporation. This was the second concrete ship to slide into the water at the southern shipyard, the first having been launched several months ago. A third hull is being constructed there, and is expected to be ready to leave the ways in the near future.

## AERIAL LEAGUE IS PLANNING TRANSCONTINENTAL DERBY

Prizes aggregating more than $100,000 are to reward the winners of the transcontinental Derby planned by the Aerial League of America. The ambitious project, like the Toronto-New York handicap, will test the efficiency of various types of planes, in addition to intensifying public interest in aviation. With this last end in view the promoters have decreed that the long race be divided into legs of 250 miles each, with a compulsory stop at the end of each leg. Prizes will then be awarded by a point system, contestants being graded on the performance of each leg. Rear Admiral R. E. Peary is to choose the committee which will establish landing places, at intervals of 50 miles, along the Woodrow Wilson transcontinental airway.

## MOTOR-CAR ACCIDENT SHOWN BY MECHANICAL SIGN

Careless pedestrians and reckless automobile drivers were shown the folly of their ways by means of a mechanical signboard during a recent anti-accident campaign in Detroit. A miniature motor car, fastened to a moving belt, ran swiftly across the face of the board, painted to represent a street intersection, and on each trip knocked down a figure which was supposed to be a man standing outside the space outlined as a safety zone for persons on foot. An electric motor behind the board actuated the belt.

Mechanical Signboard in a Detroit Park, Representing a Street Intersection, on Which a Miniature Automobile Accident is Enacted by a Tiny Motor Car and the Small Figure of a Man

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## FRENCH MEMORIAL DIPLOMAS ARE SACRIFICE RECORDS

France has officially adopted a design for a memorial diploma, on which are

BY COURTESY OF L'ILLUSTRATION

**Memorial Diploma being Distributed by the French Government to Schools and Public Halls for Inscription with the Names of Fallen Heroes**

to be inscribed the names of those patriots from each community who made the final sacrifice in the war, and 200,000 of the parchments are being distributed to schools, and city and county halls. In the design, Victory writes the names of the heroes within an arch, guarded, at the right, by a sentinel poilu and surmounted by the watchful figure of the lion of Belfort, while at the foot France mourns. An inscription reads "All France Stands Up for the Victory of Right."

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Claims are being filed in Mexico on deposits of oil believed to be of great importance, newly discovered in the vicinity of Mapimi, Durango. Some concessions have been granted, and are practically ready for operation. The district is near a large mining section, and has railroad connection with Monterey.

## PICK EGGS WITH TWEEZERS FOR LIVING

Nimble-fingered girls are employed in the Washington state fish hatcheries for picking eggs—the eggs of salmon. This work requiring delicate manipulation, women and girls are peculiarly adapted for it. The eggs to be hatched are placed in long troughs, and as some of them turn white, indicating that they are not fertile, it is the duty of the feminine employes to spot these white eggs, which they pick out with tweezers. Formerly men did the work, but when male labor sought more profitable employment during the war, women efficiently filled their place and even some of the female inmates of the Western Hospital for the Insane were used on this particular job, with benefit to themselves, for they like the work, and it keeps them in good physical condition. Also, since about 80,000 lb. of fresh salmon from the hatcheries go to the hospital each year, their employment means an economy to the state. One of the women last year picked 3,500 eggs, which is a record.

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## FIRE-ALARM HAMMER DRIVEN BY ELECTRIC MOTOR

Intended for use with large fire-alarm gongs, a new striking mechanism is made with a number of adjustments which permit variations in the sound, and use with gongs of different sizes. A small electric motor rocks the spring-mounted hammer head by means of a throw rod which may be changed in length, altering the relation of hammer head and gong, and thus the volume of sound produced. The resilient hammer arm may also be lengthened or shortened for use with gongs of different dimensions.

**By Varying the Length of the Throw Rod the Reciprocating Hammer Arm is Made to Hit the Fire-Alarm Gong with More or Less Force, Thus Altering the Volume of Sound Produced**

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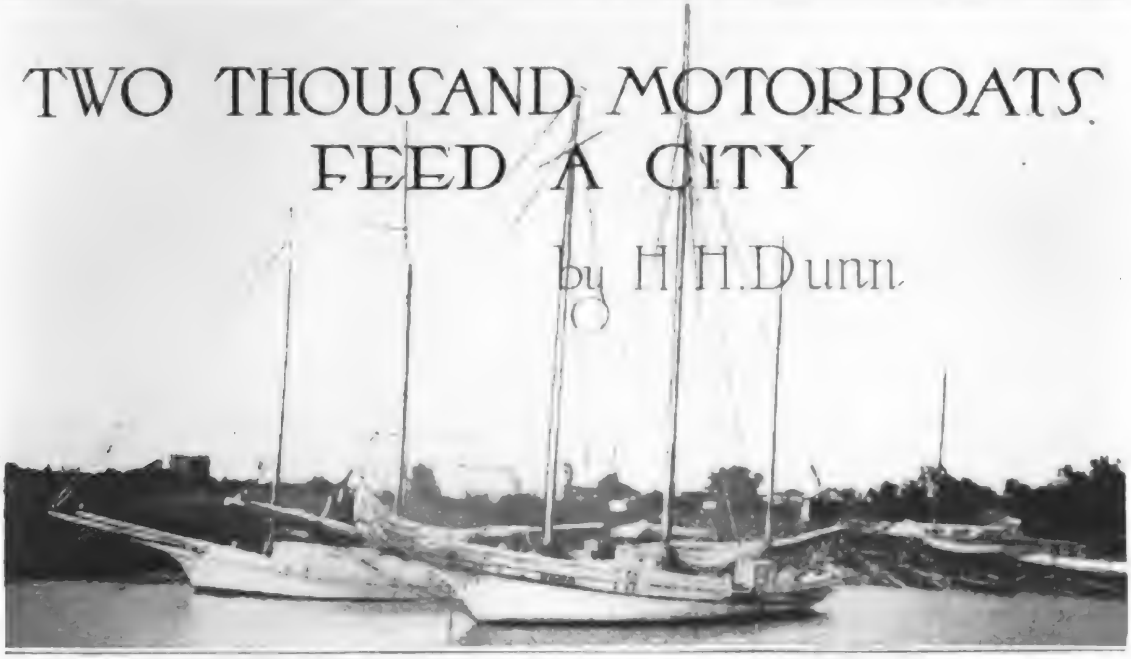
# TWO THOUSAND MOTORBOATS FEED A CITY

by H. H. Dunn



**Motorboats with Masts and Sails, Called "Auxiliaries," are Used to a Large Extent for the Transportation of Freight and Lumber on the Lakes of Louisiana. The Fleet of Them Seen Here Is in Bayou St. John, in the Heart of the City of New Orleans, Where They Make Their Headquarters**

AT the lowest possible estimate, one-fourth of the food the 400,000 inhabitants of New Orleans eat is brought to them by motorboat, and it requires 2,000 of these, working every day in the year, and some nights, to fill the demands put upon them. This is the largest fleet of working motorboats gathered at any one point in the world. They range from cross-river ferries devoted to carrying fish, vegetables, sugar, and rice from the heads of the canals on the west bank of the Mississippi, to the markets on the east, to larger and smaller boats making 150-mile runs south and west through the great 5,000-mile gridiron of canals, bayous, rivers, lakes, and bays that make 12,000 square miles of Louisiana a marsh whose only connection with the outside world is by water.

Market men and motorboat builders and owners of New Orleans estimate that the boats, none of which is more than 80 ft. long—most of them only about 30 ft.—last year carried produce and merchandise worth $17,000,000 between the farms, fisheries, and settlements of southwestern Louisiana and New Orleans. This does not take into account the hundreds of thousands of dollars' worth of oysters carried to Houma, the second oyster port in the world, nor the vast quantities of sea food that go to the packeries on the gulf coast outside of Louisiana.

Much mail is also carried on these boats, and, besides, they furnish transportation for hundreds of passengers.

**Dispatch Boat on the Barataria and Lafourche Canal, One of a Number Belonging to the Canal Owners, and Used to Keep the Waterways in Order**

The boats from the Barataria section, in 1918, carried to New Orleans more than $250,000 worth of potatoes alone, and those from Grand Isle, about 100 miles from the Louisiana city, brought to it 60,000 crates of cucumbers, valued at about $300,000. Cauliflower from the same place amounted to $310,000, and the celery from southwestern Louisiana added approximately $150,000 to the value of the vegetables handled. It must be remembered, too, that on their return trips the boats carry to the villages merchandise, clothing, shoes, and other commodities worth nearly as much as the produce they bring to the city. Practi-



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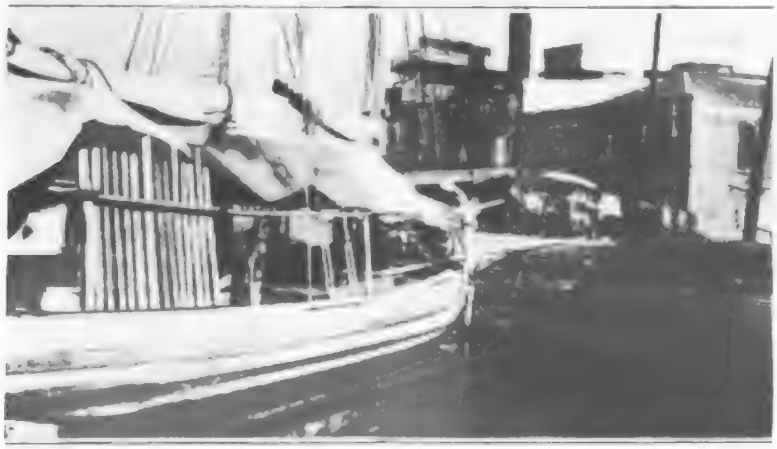
One of the Many Motor Freighters of New Orleans, on the Barataria and Lafourche Canal: The Boat is Making One of Its Regular Cruises to Morgan City, Which Is About 150 Miles from New Orleans. Just at This Point the Canal Crosses the Bayou Lafourche at Tide Level

cally all the building materials which are put into the homes and business structures of these villages, into the bridges which carry the few wagon roads across the streams, and into the very boats by which this large traffic is carried on, are transported the same way.

This fleet, which represents an investment of more than $1,000,000, and costs close to $100,000 a year in upkeep, may be roughly divided into three classes: First the fishing boats, engaged in catching the fish, seining the shrimp, and tonging the oysters of southwest Louisiana, and in bringing them to New Orleans; second, the motor freighters, which, ordinarily, ply routes as regular on schedules as fixed as those of ocean liners, and form virtually the only connection of thousands of families with the outside world; and third, the large fleet of miscellaneous craft used as dispatch boats by the canal companies, as messenger boats for the sea-food packeries; this class including the fleet of 12 patrol boats, maintained by the State Department of Conservation, which, having control of all the natural resources of Louisiana, is a sort of guardian angel for the whole work fleet.

The fishing boats are of two kinds, those engaged in catching the fish, oysters, and shrimp in the sea and the bayous, and those to which this product is transferred to be rushed to the New Orleans market or to the various packing plants. The former seldom appear in New Orleans, though they all hail from that city as their home port. The latter consist of the long, slender, swift oyster runners, which, leaving the rim of the gulf at nightfall with four or five tons of iced oysters or shrimp, are in New Orleans, 110 miles away, at four o'clock the next morning; and of the heavier, slower freighters, which bring from 10 to 20 or 30 tons of fish, packed in ice, at much slower pace, to be sold for hotel and restaurant, and packing purposes. The engines of the "runners" are all gasoline-burning, and of lighter-duty type than those of the larger, slower boats, which usually have heavy-duty motors, frequently driven by kerosene instead of gasoline, and not infrequently adapted to both fuels.

The freighters range more to the north, through the sugar, rice, and farming country, and instead of tying up at the heads of the canals which lead from the Mississippi into the hinterland of Louisiana, dock at the city side of the river, where a wharf, nearly two blocks long, known as the Bienville Street Landing, is reserved for their exclusive use. Most of these boats are of heavy construction, built to withstand the severe storms which sweep the gulf coast and farther inland over the flat lands. They average about 80 ft. in length, driven by gasoline, kerosene, producer-gas, or even, now and then, a crude-oil engine. The two canals, the Harvey's, and the Barataria and Lafourche,



Charcoal and Fire-Wood Schooner with Auxiliary Engine: Much of New Orleans' Fuel is Brought to the City by Boats of This Kind

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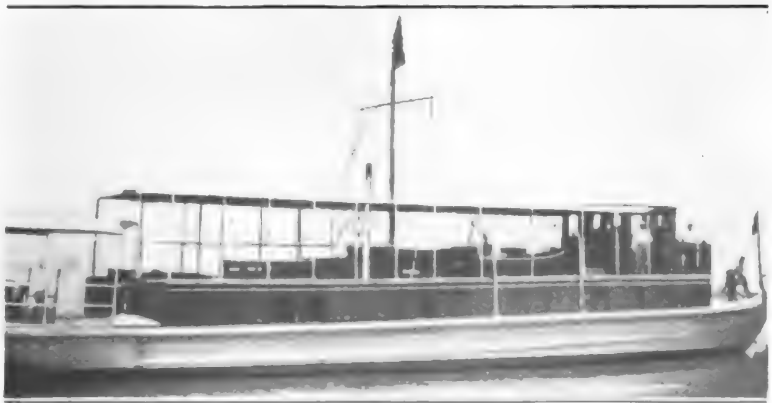
run west, like trunk lines of a railroad, from the Mississippi River, into which they lock at New Orleans, crossing all the main north-and-south natural waterways, such as the Bayou Lafourche, Bayou Barataria, Bayou Terrebonne, the Atchafalaya and Vermilion rivers, and a myriad other smaller streams, which give to the gulf on the south, and run into the "sugar bowl" on the north. Along these trunk-line canals the freighters operate, going up and down, at the tide-level crossings, on the streams they meet, to the scores of small towns and even cities like Houma, Morgan City, Lake Charles, and Lockport, as far north as Donaldsonville.

A Few of the Motor Freighters Which Connect Scores of Settlements in Interior Louisiana with the Market at New Orleans, Where They are Seen Docked at the Bienville Street Landing

All the way they distribute merchandise from New Orleans, carrying everything from arsenic for the trappers to zithers for the trappers' daughters. Almost every one of this fleet is a mail boat, and every one furnishes free transportation to the fathers of the church who travel hundreds of miles over the inland waterways to baptize, marry, and bury. Seaworthy boats they are, with hulls built of 2-in. cypress, reinforced with oak; turning back for few storms, and many of them with 25 to 30 years of constant daily service behind them. The majority were originally sailing craft, known as "luggers," whose owners installed internal-combustion engines as soon as these motors became commercially practical.

Probably seven-eighths of the total fleet of motor work boats at and around New Orleans are in these two classes, while the third consists of, say, 250 boats which represent the "class" of the fleet. That is to say, they are high-speed dispatch boats, doing their 25 to 30 miles an hour, carrying the owners, managers, and superintendents of the canals along the waterways, where dredges and "lily-boats" are constantly at work keeping the channels deep enough and destroying the rafts of floating water hyacinths which work such havoc with propellers and shafts of small craft. Among them are also a number of comparatively fast boats used by traveling salesmen, who find them swifter, more economical, and with more facile schedules than the regular boats, or even the railroad trains. Frequently they drive them themselves, carrying their samples, no matter how bulky or how heavy, right with them. Such boats make their headquarters in either the New Basin Canal or the Bayou St. John, both of which penetrate the heart of the city of New Orleans, each connecting a railroad station with Lake Pontchartrain; or in the headwaters of the Harvey, or the Barataria and Lafourche canal, on the other side of the river, easily accessible by ferry. The average value of these boats is probably



Motor Flagship of the Louisiana State Department of Conservation, Which Keeps Guard over the Fishing Fleet, the Banks, and the Oyster Beds

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slightly higher than that of the work boats proper, ranging from $750 to as high as $1,200.

In this class also belong the motor tugs, which are slowly but surely replacing steam tugs for all the lighter work of the port; the ship chandlers' boats, and the dispatch boats used constantly by firms who have their offices in New Orleans and their plants in Algiers, Gretna, or Westwego, across the river. Nor should the big steel self-propelled barges, ranging from 250 to 700 tons, be forgotten. They bring coal and iron ore from the Alabama fields to New Orleans, and carry back merchandise to all the towns along the coast of Mississippi Sound, and up the Mobile and Warrior rivers in Alabama. They do not, of course, belong to the fleet which feeds New Orleans, yet New Orleans is their home port, and they handle a huge and profitable traffic of coal at greatly reduced freight rates. These big barges, driven by gas-producer engines, are worth from $50,000 to $75,000 each.

Vegetable-Carrying Motorboats from Grand Isle and the Barataria Districts, being Locked Through from New Orleans into Harvey Canal

Neither should one overlook, in considering the size and the work and the value of the motorboat fleet of New Orleans, the 200 or 300 boat yards, which, scattered from New Orleans west to the Sabine River of Texas, north to the Red River, and south to the rim of the Gulf of Mexico, build this fleet and keep it in repair. Most of these yards have been in the same family since the days of the Louisiana Purchase, or shortly thereafter, and through generations their owners have learned to build exactly the boats suited to the work in hand, boats which far outlive their builders or their original owners, and earn tremendous profits on their first cost as their years of useful service increase.

## GATEWAY TO OLD CEMETERY OUTLASTS ADOBE WALL

Time and the elements have almost destroyed the adobe wall around one of the oldest cemeteries in the country, located near Taos, N. M., but the gateway to the burial reservation still stands, its locked doors supported in a small section of the crumbling inclosure. Barbed wire replaces the wall of sun-dried brick.

Gateway to an Old New Mexican Cemetery Which has Survived the Adobe Wall in Which It was Set and Many of the Crosses in the Graveyard

## SOUTHERN SWAMPS FURNISH LIZARDS FOR GREENHOUSES

Having received orders for several thousand lizards, a New Orleans concern has advertised for a number of men and boys to assist in searching the near-by swamps for the elusive little reptiles. The only qualification demanded of the would-be lizard hunter is that he have more "pep" and agility than the lizard, which he must catch bare-handed. The company ships the lizards in large quantities to greenhouses in the North and East, where the little animals earn their board by ridding the plants of insect pests. A smaller number are sold as pets. The lizards abound in this section.

¶Sighting an eagle high above Atlantic City, N. J., a number of airmen armed themselves with shotguns and gave chase in their airplanes. The bird escaped.

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# DESTROY BIG BUILDINGS TO WIDEN RIVER BED

The Scioto River at Columbus, Ohio, is Now Flowing through a Recently Made Cut That Forms Part of Its New and Exceedingly Expensive Channel. In the Stream are Still to be Seen the Wrecks of Bridge Piers Destroyed by the Disastrous Flood Six Years Ago. The City has Purchased All Property on This Bank, the West, for 300 to 500 Feet Back, and is Now Wrecking the Buildings

Nearly 500 Buildings are Included in the Strip of Property to be Cleared to Make Way for the New River Channel, and Many of Them Were Very Valuable. The Laundry Whose Stack Alone Remains Standing in the Picture, Cost the City $65,000, and a Big Chain Factory was Condemned at an Appraised Value of $200,000. The Work of Changing the Industrial District into a River Bed is Expected to Take Another Two or Three Years



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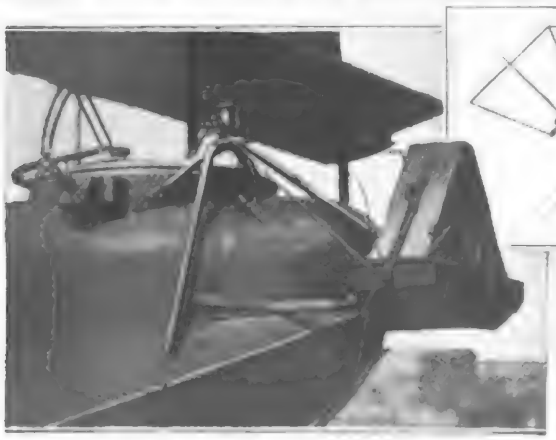
## TRIPLE CAMERA FOR AIRPLANE MAKES WIDE, ACCURATE MAP

An aerial map-making camera of new design in use by the army engineer corps



Airplane Camera with Three Lenses, Which Point Downward at Different Angles, as Shown in the Diagram, Covering a Strip Three and One-Half Miles Wide at a Height of Only 4,000 Feet

operates with three lenses arranged at such angles that their fields lie side by side. As a result, at a height of only 4,000 ft., a map strip covering a width of three and one-half miles may be taken, the three sections matching perfectly. So accurate are these maps that when one of the city of Washington, recently made, was checked against a survey map of the usual type, it was found that all points exactly coincided. The system is used not only for military purposes, but for plotting the routes of the aerial mail service.

## OCEAN SOUNDED BY ECHOES FROM BOTTOM

By sounding with sound waves instead of a steel cable a Frenchman has been able to determine the depth of the ocean in a few seconds where the ordinary process requires minutes or hours. In contrast to the usual equipment of cable, reels, and donkey engine, he equips himself simply with a quantity of high explosive, a microphone, and a chronometer. Detonating a charge of explosive in the wake of his moving vessel, he hears in his microphone both the noise of detonation and the echo produced by reflection from the bottom. Reading the time interval from the chronometer and knowing the speed of sound in water he is able to calculate the ocean's depth at that point. Tests have shown that the method yields sufficiently accurate results for practical purposes.

## MOBILE LAUNDRIES ORDERED TO MEXICAN BORDER

Mobile laundries will soon be in operation near the Mexican border for the convenience of American troops on patrol duty in the troubled region. A recently issued order authorizes the organization of six companies of 37 men each to take charge of the work. Especially qualified members of the Quartermaster Corps will be chosen. Six other companies of similar size will be formed in the same manner to handle a like number of mobile laundries now in storage. It has not been disclosed where these will be sent.

## SHIFTER FOR POWER BELTS ACTS AT TWO POINTS

Belts are shifted simultaneously on overhead power-shaft pulleys and machine-driving pulleys by a device recently developed by an Ohio manufacturer. Two duplicate sets of gears are used, one near the shaft and the other near the machine. These are connected by a rod that synchronizes their action. When a crank on the lower set is turned, belt guides above and below move in unison across tracks which parallel the power shaft, sliding the belt from one position to another. The mechanism is especially adapted for use with stepped pulleys. It can be adjusted for belts of different widths. Time is saved and the danger of accidents reduced by the shifter, which requires little attention.

¶ Carbon tetrachloride, commonly used in the familiar forms of portable fire extinguishers, is partly decomposed by contact with red-hot iron or blazing wood, and poisonous gases are liberated in small quantities, according to the findings of the U. S. Bureau of Mines. Such apparatus, therefore, should be used with care in inclosed places.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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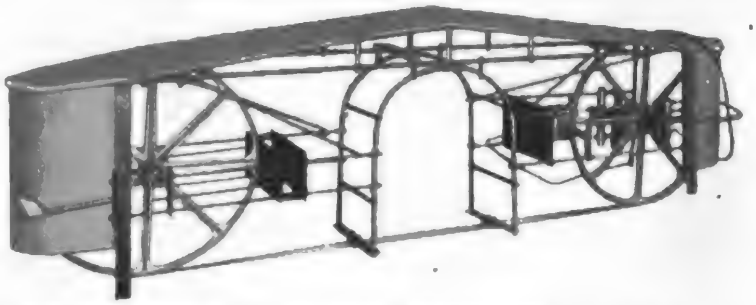
## PORTABLE BAND SAW DRIVEN BY ELECTRIC MOTOR

A portable, electrically driven band saw for felling trees has been designed by a Texas lumberman. The endless cutting blade runs on two wheels that are mounted at opposite ends of an iron-pipe frame. In the center of the frame, the band passes through slots, which turn it to the proper position for cutting when the contrivance is applied to a tree. Power is furnished by an electric motor, the shaft of which bears on the rim of one of the drivewheels. Insulated wires are attached to a feed line and strung on trees to the scene of operations.



Trees can be Felled by Electricity with This Portable Band Saw. The Driving Motor is Mounted on the Pipe Frame near the Wheel on the Right. A Texas Lumberman Designed the Contrivance

## NAVAL AIRMEN'S BARRACK EQUIPPED LIKE CLUB

Naval airmen who are quartered in the officers' barrack at the naval station at San Diego, Calif., will enjoy living and recreational advantages equal to those of the best equipped men's clubs. The barrack, which cost about $500,000, is nearly ready for occupancy. It is a fireproof structure, and of Spanish architectural design. Besides comfortable sleeping rooms, the building contains a swimming pool, a library, billiard and pool tables, a gymnasium, and a bowling alley.

Equipped and Furnished Like a High-Class Men's Club, This $500,000 Barrack, Nearing Completion at the United States Naval Station at San Diego, California, will House Officers of the Naval Air Service. It is a Fireproof Building

## SCRAPPED SHIP PLATES MADE INTO CRANE HOOKS

Salvage of scrapped material and economy of operation are the watchwords of modern factory management. An example of both is furnished by a shipyard that uses the oxyacetylene-cutting process in converting old ship plates into large crane hooks. These hooks are 8 ft. long and consist of six full-length layers of plates and four shorter ones, all held together by countersunk rivets. The four inner plates are of ½-in., and the two outer plates are ⅞-in. material. Half-length plates, ½ in. thick, adjoin the outer plates on either side, while two shorter plates, ⅞ in. thick, reinforce the hook proper.

This Big Crane Hook Cost Little to Make, as Old Ship Plates of Steel were Utilized, First being Cut into Proper Shape with an Oxyacetylene Torch, and Then Fastened Together with Rivets. It is Eight Feet Long and Strong Enough for Any Load

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## SMALL MUSEUMS ENCOURAGE NATURAL-HISTORY STUDY

The study of natural history is encouraged in some Russian cities by means of miniature museums, which are nothing more than large glass show cases, located in public squares, vacant store rooms, and other places where people in large numbers congregate or pass. These are filled with specimens taken from the larger exhibition places. Pedestrians with a few moments to spare find it profitable to loiter in front of the convenient displays to study the stuffed birds and animals under the glass. The contents of the cases are changed weekly, thus providing new and interesting exhibits at frequent intervals. Lectures are given at the small museums at noon hours and on holidays. The large museums have not been closed, though fewer persons visit them than before the establishment of their smaller counterparts.

Lecturer in a Russian City Describing the Contents of a Street-Corner Natural-History Museum to an Interested Audience of Pedestrians. The Lectures are Given at Noon Hours and on Holidays

## CONCRETE BRIDGE IN SWEDEN ONE OF WORLD'S LARGEST

One of the longest reinforced-concrete railway bridges in the world has just been completed in Sweden, crossing the Ore River. The arched span of the new bridge measures 297 ft. 6 in., and it is built to carry trains running at speeds above 60 miles an hour, with axle loads of 20 tons. The construction cost nearly $560,000, the original estimate, made before the war, being $227,800.

## SIMPLE INSTRUMENTS DETECT COMBUSTIBLE GAS IN AIR

Detection and measurement of minute quantities of illuminating gas, carbon monoxide, hydrogen, and other inflammable gases in air, are made easy by simple instruments recently developed by the U. S. Bureau of Standards. All three forms depend upon the heat-producing absorption of such gases by platinum. In one, four platinum wires form the arms of a Wheatstone bridge, two opposite wires being exposed to the air under test. Absorbed gas increases the resistance, giving a positive indication at a distance. A portable form has two loops of platinum wire heated by a battery. The glow of the wires is balanced by rheostats. When one wire is exposed and absorbs gas, less current is required to make it glow, and the rheostat adjustment indicates the amount of gas present. A third form uses a bimetallic thermostat to reveal the relative heat of the two wires, and, if desired, to ring an alarm. The first form may be arranged to report from several points at once.

## AUTOMOBILE RADIATOR CAP CONDENSES VAPOR

Loss by evaporation of water, or antifreezing solutions, from automobile cooling systems is said to be prevented by a new radiator cap, which consists of several flat, circular chambers, placed on top of one another, and connected with a threaded cover that screws into the radiator inlet. Vapor condenses in the chambers and returns to the radiator as liquid. A whistle which is blown by vapor pressure is incorporated in the device as a heat indicator, and gives a shrill warning note when overheating threatens.

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Semiautomatic Gates, Set in a ing the Level of Lake Merritt, Oakland, California: At the Structure. The Gates Them

Concrete Dam, for Maintain- a Small Body of Salt Water in Left Is a General View of the selves are Shown in the Picture

**on the Right. They are Swung Open by the Incoming Tide, and Closed When It Recedes. Below is Illustrated the Top of One of the Abutments**

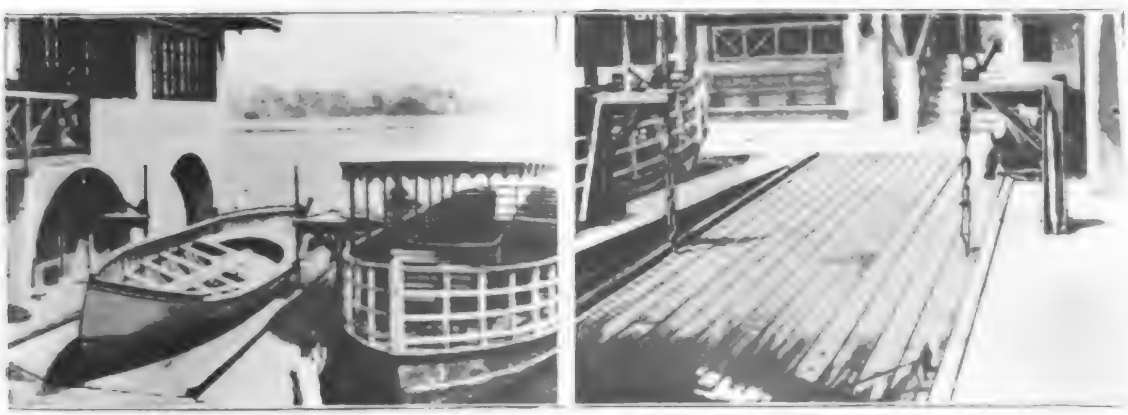
# BEAUTIFUL LAKE HAS MANY IMPROVEMENTS

By C. W. GEIGER

THERE are a number of things about Lake Merritt, the beautiful 170-acre body of salt water situated near the heart of Oakland, Calif., that distinguish it from the ordinary. Possibly the most interesting of these is the semiautomatic level control, which prevents the lake from falling when the tide in San Francisco Bay, its source of water supply, is flowing seaward. Four swinging gates, requiring but little attention from their attendant, and set in a concrete dam at the point where the lake connects with the bay, open by water pressure when the tide rises, but close when it recedes. Provision is made for repairing the gates by shutting the water off from them with boards slipped between two of the abutments of the dam. If it is desired to lower the level of the lake, the gates may be opened.

Another unusual utility to be seen at the lake is a wooden apron, or platform, which raises small boats out of the water for painting or repairing. Boats are floated over this platform while it is submerged. Two jacks of special construction raise the platform and its burden clear of the water. The jacks have long geared bars running through them, allowing a drop sufficient to submerge the platform, which is attached to the bars by strong chains.

Danger of drowning or accident on the lake is lessened by an alarm system similar to the regulation fire-alarm system. Alarm boxes are placed at 11 points on the shore of the lake, these being connected with a location-registering apparatus at a life-saving station. A speedy motorboat, manned by life-savers and equipped with grappling hooks, is sent out when an alarm box is operated. In order to provide more seating room on



**Dry Dock for Small Craft: At the Left a Rowboat has been Raised from the Water on a Submersible Platform Provided Especially for the Purpose. Jacks, Which Attach to the Sides of the Apron with Chains, are Used to Raise It. A Closer View of the Device is Presented on the Right**



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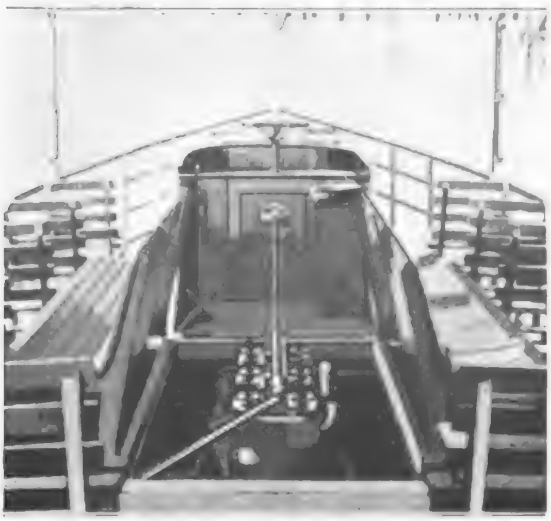
a motorboat running on the lake, a settee, made in two sections, was placed over

The Seating Capacity of a Launch Which Runs on Lake Merritt, in Oakland, California, is Increased by This Double Settee over the Engine Pit

the engine pit. The sections may be moved easily if access to the engine is



By Moving the Benches Aside, It Is Possible to Make Repairs or Adjustments on the Motor That is Concealed beneath Them

desired. All boats are operated by the city, and it is estimated that they are used by 100,000 persons annually.

## COMPOUND OF OIL AND RUBBER IS NEW WATERPROOF PAINT

A new paint compound being manufactured under patents in a western city is credited with a number of remarkable qualities. Being based on dissolved rubber and linseed oil, it forms a waterproof and flexible coating, and only one coat is needed. Used instead of oil in mixing paints, it covers one-fourth more surface, and takes only half the usual amount of pigment. Two interesting applications have already been made. On a Seattle bridge, 97 gal. were applied in 17 days, as against an estimate of 370 gal. and 34 days with common paint. Concrete grain-elevator pits which seeped water have been entirely dry since receiving a coat of the compound.

## DESTROY CRANBERRY PESTS ON PACIFIC COAST

A successful fight has been waged by Pacific-coast cranberry growers against the black-headed fireworm, a destructive insect pest believed to have been taken across the continent on cuttings from eastern-coast marshes, and a record crop of the berries is expected this year as a result. In 1917, about one-third of the cranberry crop in that section of the country was destroyed by the worms, and last year approximately one-fourth. Cooperating with the growers, the Department of Agriculture has established an experimental station in the heart of the western cranberry-producing section, and maintains a corps of experts there for the study of local problems.

## SELL EVERYTHING BUT DRUGS IN DRUGLESS DRUG STORE

Subtraction being the order of the day in these times of fireless cookers, waiterless restaurants, and wireless telegraphy, a drug store, recently opened in a western city, is minus drugs. Almost everything sold in a modern drug store can be purchased in the drugless drug store, except the articles from which its name is derived. The stock includes perfumes, toilet

Drugs are Missing from the Stock of This Drugless Drug Store, but All Other Items Found in an Ordinary Shop of This Kind are Sold

articles, ice cream, cigars, stationery, magazines, cameras, and many other items.

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## COACHES TELESCOPE IN REAR-END COLLISION

Compared with the tremendous volume of traffic that streams endlessly, day and night, over the ever crowded elevated, surface, and subway lines of New York City the casualties seem almost negligible. Yet it is inevitable that occasionally a small gear in the great machine should slip, taking toll in human life. And such a mishap recently occurred when the brakes failed to work on a Third Avenue elevated train. A ghastly rear-end collision was the result. The two wooden coaches telescoped for a quarter of their length, crushing and mangling their human freight. Some victims were so securely pinned in the wreckage that the fire department was called to use ax and saw in the rescue work. Alone and helpless in his crowded little compartment, the motorman of the second train was the first to pay for the mad ride. Luckily none of the cars toppled off the elevated structure.

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**This Photograph was Taken Just a Few Minutes after the Rear End Collision of Two Wooden Elevated Trains in New York City. The Firemen have Already Chopped Away Enough Wreckage to Permit the Extrication of the Motorman's Broken Body**

## BIGGEST PIER IN ALL EAST TO BE BUILT AT MANILA

A new pier to be built at Manila, Philippine Islands, will be the largest, most completely equipped, and most modern structure of its kind in all the East. The sum of $700,000 has been appropriated for its construction and the installation of its machinery. When "Pier No. 7," as it is officially known, is completed, the present problem of unloading cargoes from foreign ships will be solved, and the congestion of shipments ended.

## TOPOGRAPHER'S DUTY CARRIES HIM HIGH ABOVE CLOUDS

As they study the maps in guidebook or atlas, few persons realize that every line in every map was originally traced from nature, sometimes with the greatest difficulty and always with infinite care, by some expert topographer. Thus the map maker in the photograph has been compelled to climb, with instruments on his back, to the snowy summit of a western peak. Here, high above the clouds, he has set up his plane table, tying down the legs to save it from the clutches of the wind.

**This Map Maker has Set Up His Plane Table on the Snowy Summit of a Western Peak after a Toilsome Climb through the Clouds with Instruments on His Back**

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# HERMIT PAINTER FASHIONS HOME OF BEAUTY

The Snuggest Little Home in All the Dunes Is "Mack's Shack," Which Braves the Loneliness of Sand and Wind on the Shores of Jamaica Bay, near New York City. Here the "Hermit Painter" Welcomes Friends from the City

A Tumble-Down, Weather-Beaten Cottage Greeted the Painter When He Arrived from the City, Scene of a Nervous Breakdown, and a Doctor's Warning to Flee from the Turmoil. "Mack" Brought with Him into His New Abode Some Baggage, Many Books and Paintbrushes, and an Unbounded Love of Beauty

The Old Cottage was Soon Transformed. Sea-Rusted Iron, Water-Rounded Stones and Bricks, Ships' Planks and Timbers, the Painter Found on the Shore and Used in the Work. An Old Galley Stove and a Nail Keg Sufficed for the Quaint Kitchen



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# AND COMFORT FROM DRIFTWOOD ON SEASHORE

On a Raw Winter Night When the Wind Whistles in from the Bay, the Best-Loved Retreat in "Mack's Shack" Is the Study with Its Fireplace, Where the Kettle Waits to be Swung over the Leaping Driftwood Fire

The "Hermit Painter" has Built Two Fireplaces into His Study. Above This One are Ranged Bits of Driftwood, Carved and Polished like Old Egyptian Bas-Reliefs. Behind Them, and above the Wainscoting, the Painter has Reproduced an Egyptian Wall Painting

During the Eight Years in His Picturesque Little Home the Artist has Designed for Himself This Window of Leaded Glass. Having Designed It, He Painted It, Assembled It, and Set the Finished Product in Place

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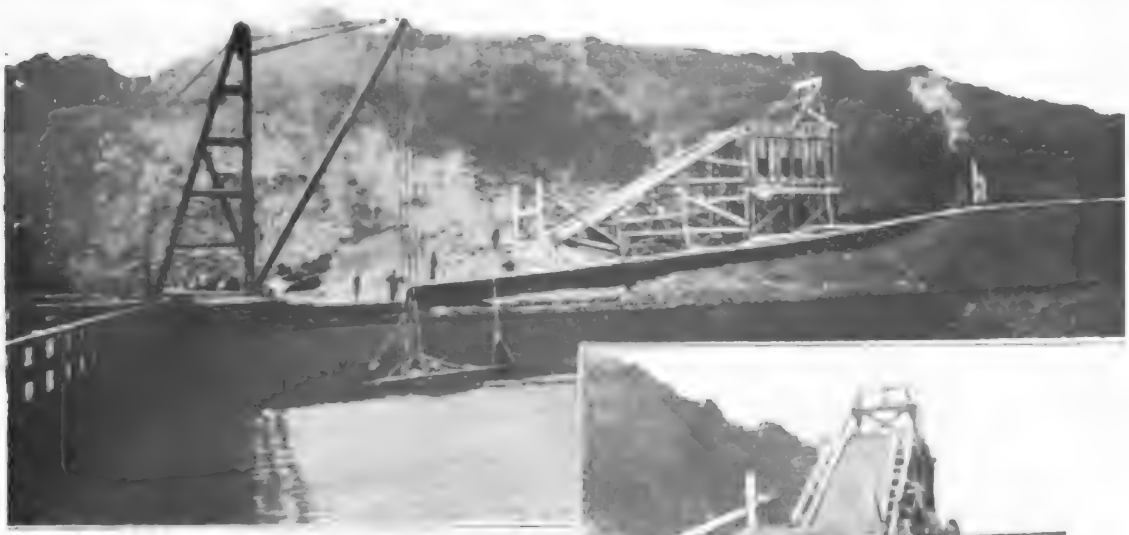
# BUNKERS FOR EXCAVATING KEEP SHOVELS WORKING



Steam Shovels were Kept in Constant Service by These Bunkers, Which Held Excavated Material for the Wagons. This System was Employed by Contractors in a Western City

The Inclined Plane up Which the Shovels were Dragged for Dumping into the Bunkers, Located at Its Upper End

By using bunkers, from which material was dumped into wagons for hauling, two contractors of a western city found that they could keep their steam shovels steadily employed on excavating work, as this system obviated waiting for the arrival of a wagon to receive the load direct from the shovel. One contractor used an inclined plane, up which he dragged the loaded shovel by means of a steel cable. At the top of the incline the shovel was dumped into the bunkers below. The other con-

Digging a Trench in the Middle of a Street, Using Bunkers to Receive Excavated Material: A Cable Stretched between Two Towers Carried the Shovels. How a Steam Hammer was Moved with the Device is Shown in the Picture at the Left

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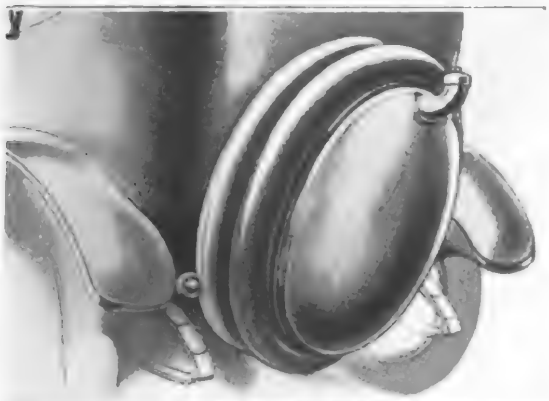
tractor, who was engaged in digging a trench in the middle of a street, stretched a cable between two towers, located over a block apart, and on this moved the loaded shovel to the bunkers for dumping. It was possible to lower the shovel into the trench at any point from the overhead cable. Dump-bottom wagons were used by both contractors for hauling.

## CYLINDRICAL GASOLINE TANK CARRIES SPARE TIRES

Two automobile accessories are combined in one by the recently patented invention of a Detroit man. These are a



Combined Gasoline Tank and Spare-Tire Carrier for Automobiles: Rims can be Slipped on the Cylindrical Container and Locked in Place

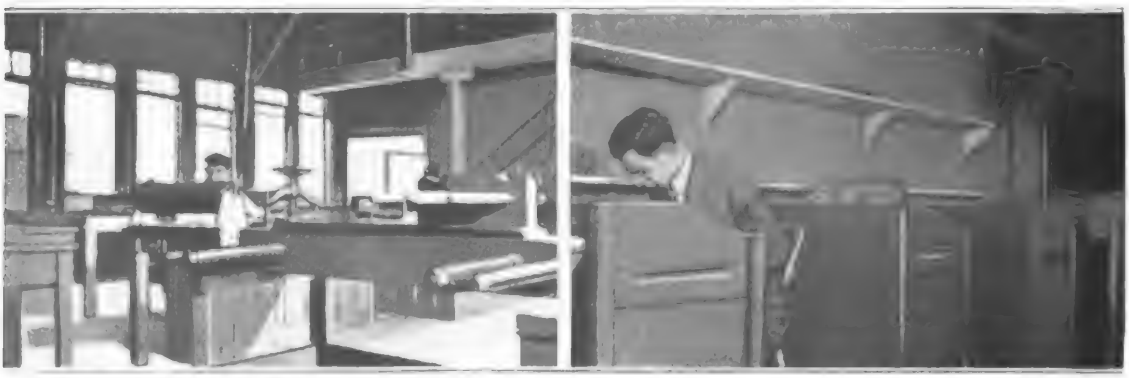
gasoline tank and a tire carrier. The tank is a steel drum, designed to be fastened at the rear of a car body in a tilting position. Recesses for two spare-tire rims are provided on the cylindrical container, and a special locking device holds them firmly in place when they are slipped on the tank. A curved filling pipe is placed in the rear head of the drum.

## PLAN TO PUMP OUT MINES FLOODED BY GERMANS

Ten years must elapse before the coal mines around Lens, France, will be producing fuel at the pre-war rate, according to engineers who are in charge of plans for pumping out the water that was permitted to flood the shafts by the defeated Germans before the evacuation of the district by their troops in the fall of 1918. It is estimated that it will require 18 months to remove the water, which fills some of the mines to overflowing. Electrically operated pumps will be used. Current for the motors will come from a generating station not far from the scene of operations.

## TUBERCULAR PATIENTS LEARN TRADES IN SANITARIUM

Patients discharged from a fresh-air tuberculosis sanitarium in the Adirondack Mountains leave the institution equipped with knowledge which enables them to earn a livelihood, as well as with bodies free from disease. Under the supervision of the medical staff of the health resort, convalescents are taught carpentry, basket weaving, picture-frame making, bookbinding, lace making, and photography, besides other trades, by skilled instructors. Like the other rooms in the building, the workshop in which the patients are taught is supplied with an abundance of fresh air through open windows, regardless of weather conditions. In order that work may be done in cold weather, some of the benches in the shop are provided with ducts underneath the top, through which hot air passes when the temperature is low, heating the surface so that the workers' hands are not numbed by the cold.



Fresh Air and Sunlight in Abundance are Admitted to a Workshop in an Adirondack Mountain Sanitarium, Where Patients are Taught Many Useful Trades. In Cold Weather Some of the Table Tops are Warmed by Hot-Air Ducts, Which can be Seen in the Picture at the Right

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# THE SNIPER'S BAG OF TRICKS

By REX HARROW

**Ambushed in a Ruined House, the Sniper Never Took Up a Position at a Window, but Stationed Himself at the Far End of the Room, So That He could See without Being Seen**

WITH the recent return to New York of a group of U. S. army "snipers," the detailed lessons in trickery and shooting magic, taught all allied sharpshooters in the great war, became known. Ingenious and scientific to a microscopic degree, they reveal how technical, and yet how fascinating, "sniping" became in the progress of warfare.

Without a doubt the most dangerous pursuit in the war, sharpshooting was the one branch of the service that Americans clamored with the greatest fervor to join, for it harked back to a traditional American superiority—the use of the rifle. Not even the generally credited statement that a sniper's life was, on an average, but 10 days, stopped them, and with the British and French they worked out an artful system of rules that completely baffled the Germans. Toward the last of the fighting, the American sharpshooters came to be called "body snatchers," on account of their success in this particular field.

The first rule for these daring riflemen who stole out in "No Man's Land" to pick off opponents, was that they should always hide "before" cover rather than behind it. By lying down between an object and the enemy a sniper was much more efficient than when lying with the protecting object between him and his prey. He was taught to blend himself with the house, tree, wall, or trench in his rear, open to the enemy's fire, but concealed from his sight. He was never to let his head appear against the sky line; never to shoot at a German head directly in front of him but always at heads far to the right or left. This mode of procedure prevented the Germans from discovering the angle from which the bullets were coming.

Every sniper carried a barometer and a little gauge for the measuring of the wind's velocity. He knew just how much the wind swerved the bullets at any and all velocities, and just how the amount of moisture in the air slowed the speed of a bullet.

One extremely important rule was that he should swab the muzzle of his rifle after every shot, to make sure that no moisture had collected there. One tiny drop of water would, upon the rifle's discharge, send up a puff of steam that would reveal him to his carefully watching enemies.

When shooting through a loophole in masonry, the sniper must water the aperture thoroughly so no dust would be blown into the air when the rifle spoke. In shooting from a house, the sniper never occupied a window, but stationed himself at the far end of the room where he could not be seen, and sent his bullets through the window from this distance.

He was never permitted, in the later days, to use binoculars, but was supplied with a telescope, for the use of the latter meant that the gleam of only one glass lens might be caught by the enemy, thus betraying the sniper, whereas with binoculars the chances were double. With this telescope he studied enemy trenches and "snipers' nests" all day long, scarcely moving, so keen was the enemy's lookout.

Snipers always worked in pairs, one using the telescope and the other the rifle, the former whispering directions to the latter. Lying a few feet apart, so that, if one was detected, the other need not necessarily be killed also, they lay all day long in one position, their only relief being the exchange of spyglass and rifle to lessen the intense strain.

Each pair of snipers made two sets of "nests" on nights before going out, establishing a false pair of "nests" where the enemy might discover them and placing near by the hiding places which they would actually occupy. Often from the



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shrewdly camouflaged "nests" they could discover German snipers shooting at the dummy retreats and perhaps get a bullet into self-satisfied Heinie. If their nests were discovered, they took chances on wriggling out into shell holes, and thus away, but not until they had put up a little sign reading "Danger," which they always carried, so that no brother-sniper might occupy it later to his misfortune.

One of the most imperious rules was that no sniper who suspected the presence of an enemy sniper was to look directly at his adversary's hiding place. He was taught to move his eye all about the vital point—above, below, and to either side—but never squarely upon it. This was in obedience to the optical laws of man. The center of the eye fastened upon an object cannot detect action nearly so readily as can the outer sections of the eye. About the rim of the eye's pupil, action is caught quickly, and then the center of the eye automatically swings upon the object and focuses perfectly. For this obvious reason the sniper was drilled to observe this rule rigidly.

Snipers' rifles were always the pick of those furnished an entire division and were fitted with extremely complicated and accurate calibrated sights. Small telescopes, with scaled measures spaced upon them, gave the sniper the distance of an object while he sighted his weapon, and permitted him to tell within a few feet how far away his intended prey was stationed.

## EX-SOLDIER'S PEANUT STAND DISGUISES SMALL AUTO

If it were not for the familiar hood, it would be difficult to identify the chassis of the mobile peanut stand, operated in a western city by an ex-soldier, as a common type of small motor vehicle. Extremely low wheels, fitted with solid tires, have replaced the regular wheels, and the relatively large body almost completely disguises the machine. Besides peanuts, ice cream and candy are sold by the proprietor of the stand, who finds juvenile customers at the parks and in other districts where children play.

PHOTO BY UNDERWOOD & UNDERWOOD

**An Ex-Soldier's Peanut Stand is Carried on the Chassis of a Common Type of Small Automobile. The Little Wheels Lower the Counter so That It Is Convenient for Youthful Customers**

## NEW NAVY RIFLE RANGE IS LARGEST IN AMERICA

Equipped with 250 rifle targets, 20 pistol targets, all the necessary paraphernalia for small-bore matches, and a full complement of modern automatic clay-bird traps, the Caldwell Range just being completed by the U. S. Navy is the largest rifle range in the country. It is located four miles west of Caldwell, N. J., and is only 20 miles from New York City. The range is laid out on what was, until last year, a worthless stretch of marsh and timber swamp. Not only were the target butts and raised firing points completed in short order, but a number of frame buildings have been erected for the housing of the various appurtenances of a national match, ordinarily installed under canvas. The entire work of clearing and construction was done by the corps of navy range builders.

¶ Steamships now sail directly from Mobile, Ala., to European ports, including London, Liverpool, Rotterdam, and Havre. The service was established recently by a company which operates vessels out of other cities on the Gulf of Mexico.

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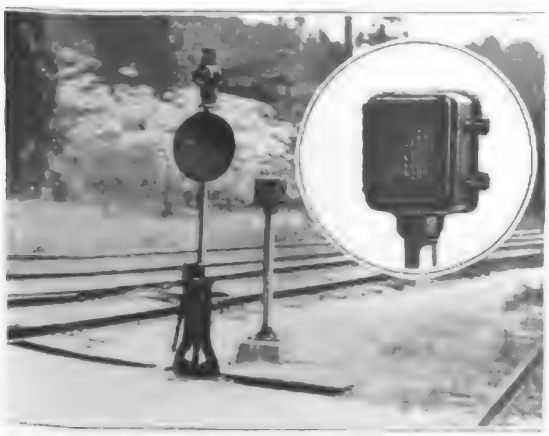
## COOLS OIL WITH CONDENSER TO SAVE SHIP'S TURBINES

Running through seas whose temperature reached as high as 88°, the steamship "Anoka," on its way from Portland, Ore., to New York, recently found itself in trouble because of the overheating of its turbine bearings. The oil cooler proved inadequate, and the oil could not be reduced below 123° F., while the bearings reached 164°. In the emergency the ship's engineer conceived the idea of using the auxiliary condenser to cool the oil, and soon had it connected to the feed. By this ingenious method, the lubricant was reduced to 103°, and the journey finished without trouble. Boiling out the condenser with soda and kerosene soon restored its original condition.

## SMALL SEMAPHORES PROTECT ELECTRIC RAILROAD CARS

In switching to the main line from tributary tracks, cars of an electric railroad in the West are protected from collisions by miniature semaphores located at all such junction points. These devices indicate the presence of a car on the main line, if it is near a switching point, by means of oscillating boards about 2 in. long, controlled by an electrically operated mechanism. The tiny signals are placed in metal boxes, and are protected with strong wire mesh. They are mounted on iron posts.



Miniature Semaphores, Inclosed in Metal Boxes, Guard against Collisions at Switches on a Western Electric Railroad

## AIRPLANE PARTS DECORATE STRANGE DINING ROOM

A New York hotel is making a bid for the patronage of airmen and their friends by decorating a large dining room with

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Around Various Airplane Parts and Insignia Centers the Decorative Scheme of This Hotel Dining Room. Ceiling Lights Glow within Glass "Bombs," as Shown in the Circle Above

replicas of airplane parts. In this effort to secure "atmosphere," the proprietors have covered the ceiling with varicolored allied insignia, interspersed with rudders and other airplane members. Illumination is furnished, in part, by glass reproductions of aerial bombs, each inclosing an electric bulb. Most novel of all, however, is the overhead electric fan which is nothing less than a four-bladed propeller projecting from a fuselage equipped with engine and machine gun.

¶ Industrial statisticians make the statement that factories well lighted by ample windows show a relative increase of 12 per cent in production, and a decrease of 25 per cent in accidents and spoilage, besides a marked reduction in labor turnover. Where window space cannot be enlarged, a liberal use of white paint is recommended.

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## AMERICAN FORCES IN RUSSIA PUBLISHED OWN NEWSPAPER

As the American Expeditionary Force in France was unified and enheartened by the "Stars and Stripes," so the lonesome troops in northern Russia were served by their own newspaper, published at Archangel as the "American Sentinel." Since the facilities were extremely limited, much credit is due the officers and men whose efforts maintained the sheet. For a time the staff consisted of only three American soldiers, two of them convalescents, aided by two Russian girls and a native pressman.

The Army Captain and the Civilian Newspaperman are Examining an Issue of the "American Sentinel," Published at Archangel, Russia, for the American Troops in the Vicinity

## TIRE SALESMANSHIP TAUGHT BY TRAVELING EXPERTS

Traveling instructors are employed by a large tire-manufacturing company to teach the managers of branch stores and the salesmen under their supervision the art of selling automobile accessories. A week is spent by the experts in each city where their services are required, the first three business days being occupied in investigating local conditions and needs, and the last three in classroom work. All parts of the country will be visited by the itinerant teachers.

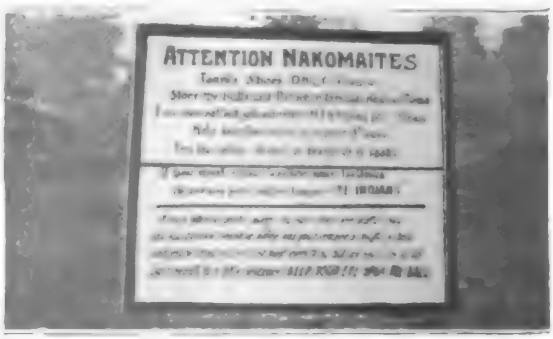
¶An alcohol fuel, recently tested by the Post Office Department, is to be used as a substitute for gasoline in the New York-Washington aerial mail service. The mileage per gallon is said to be about 25 per cent higher, with entire freedom from carbon.

## BIG STEEL BRIDGE REMOVED AND SAVED FOR NEW USE

The work of wrecking a big steel bridge over the Missouri River a short time ago was so carefully done that the parts of the structure were uninjured, and only needed refitting to give good service at some other location. Framework strong enough to resist floods was built to support the 130-ft. trussed span until a derrick car on a spur track loaded its parts onto flat cars. The 353-ft. draw span was dismembered by a locomotive crane with 75-ft. booms, guy ropes preventing tipping as the span was thrown out of balance. All rivets that threatened to cause trouble were drilled out. The end girder span was withdrawn crosswise on tracks built on falsework for the purpose.

## NOVEL SIGNBOARD APPEALS TO TENNIS PLAYERS

Poor sportsmanship is discouraged by a politely worded signboard near the courts of a Wisconsin tennis club. Besides requesting members of the organization to coöperate in keeping the grounds and equipment in condition, the painted notice suggests that players refrain from using profanity—at least, intelligible profanity—and presents a humorous verse intended to minimize display of bad temper. The signboard is declared to have succeeded in its mission, the results produced being satisfactory.




What Tennis Player could be a Poor Sportsman with This Signboard before Him? It was Erected near the Courts of a Wisconsin Club

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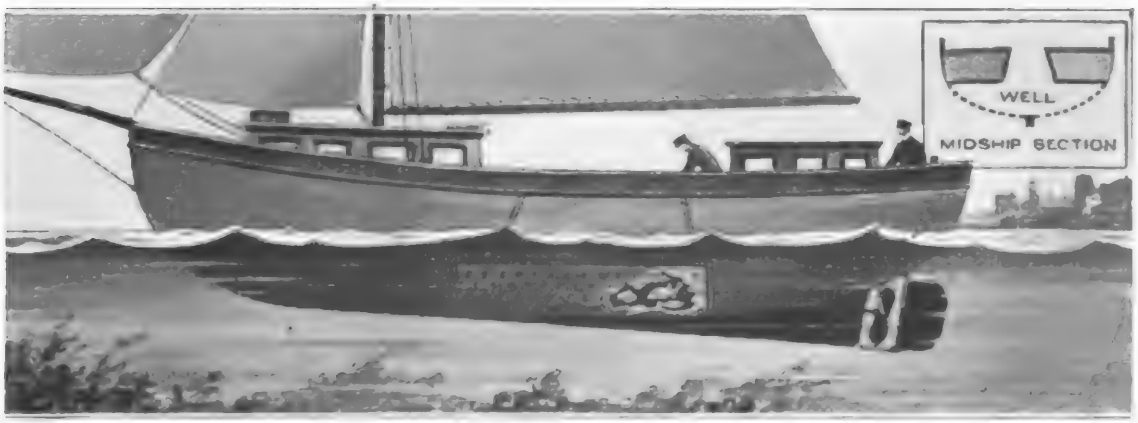


Boat for Collecting Aquarium Specimens: The Illustration Shows the Well, Located Amidships, in Which the Live Fish and Marine Animals will be Transported, and a Cross Section Indicating the Width of the Well. A Motor and Sails are Provided for Propelling Purposes, and Cabins are Located Fore and Aft for the Accommodation of a Crew of Four Men

## AQUARIUM COLLECTING BOAT HAS WELL FOR SPECIMENS

Aquarium specimens transported in the ordinary manner in shipping tanks often die after arriving at their destination as a result of the lack of proper conditions while in transit. To overcome this difficulty, a motorboat of special design has been built for the New York Aquarium, to be used for collecting fish and marine animals. Except for a well, located amidships, in which the living cargo is carried, the craft does not differ greatly from the common type of motorboat. It has a length of 35 ft., a beam of 11 ft., and draws 3 ft. of water. The well is 10 by 11 ft. at its bottom, and is supplied with water through holes bored in the hull. There is 2½ ft. of water in the well. Cabins are located fore and aft for the accommodation of four men. Besides a 25-hp. motor, the craft is equipped with sails for propelling purposes. Nets and traps are used by the crew to capture their quarry.

## DISCOVERER OF SOUTH POLE NOW LOOKING FOR NORTH

Somewhere north of Taimur Peninsula, which juts into the Arctic from western Siberia, is the schooner "Maud," and on board is Roald Amundsen, discoverer of the South Pole, bent now on finding the other extremity of the earth's axis. The explorer sailed from Norway, and was last seen at Dixson Island in September, 1918. It is reported that his equipment included two airplanes, to one of which may fall the honor of covering the final lap of the arduous journey. It is his hope, however, to strike drift ice that will take him, perhaps, to his very objective. He has a wireless transmitter on board, but no receiver, because he did not want to be "bothered by news." Amundsen will collect all possible information as to soundings, drifts, and ice, and expects ultimately to come out at Alaska or Greenland, by way of Melville Island or Grant Land.

## PARTS OF OLD AUTOMOBILES MAKE MOTORCYCLE CAR

By adding the tonneau seat of a dismantled automobile and the top of an unserviceable roadster to his motorcycle, an eastern man provided his machine with two comfortable passenger seats. The seat, with the top attached, was placed on springs over a crossbar fastened at the rear of the cycle and supported at each end by a rubber-tired wheel. Straps secured at one end to the front of the

An Eastern Man's Motorcycle Car, Made by Attaching to the Machine the Tonneau Seat of an Automobile and a Roadster Top

top, and at the other to a footboard under the seat, prevent the shelter from collapsing.

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Part of the Course of the Roosevelt Tunnel through the Cripple Creek Gold Fields: Under Beacon Hill It Runs Down to a Half Mile, While "Raises" Tap the Shafts along Its Line. The Portal of the Tunnel is beyond the Extreme Left of the Picture. The Photograph was

# TUNNEL UNWATERS FAMOUS GOLD DISTRICT

By J. E. MURPHY

DRIVEN for a distance of nearly five miles under the center of the Cripple Creek mining district of Colorado, the Roosevelt drainage tunnel has unwatered ore bodies lying deeper than the deepest workings in the district, and has furnished a permanent solution for what once seemed a hopeless drainage problem. More than ten years ago, owing to the enormous quantities of water encountered, the limit of development in the deepest shafts had apparently been reached. At that time several expensive attempts were made to lower the water level by pumping. After all attempts to unwater the district by this method had failed work was begun on the Roosevelt tunnel. The tunnel is now complete, and with its completion new life has been put into one of the greatest gold camps in the world.

Although designed to solve the drainage problem, the enterprise carried with it the romance of all such operations in the West. It was possible that any shot might uncover ore deposits of enormous wealth—and this, in fact, was what happened. Numerous valuable finds were made, the most important being a vein of rich ore, 30 ft. wide, under Battle Mountain. Another vein, intersected near Raven Hill, exceeds in value anything that has been found at higher levels. In fact, so important are the ore bodies discovered that there is now no question that the tunnel has created a new Cripple Creek at new low levels.

The tunnel averages from 8 to 10 ft. in width and 7 ft. high, and is 24,255 ft. long. Along one side is a trench, 3 ft. deep, designed to take care of the drainage after the first unwatering is completed. The portal is in Cripple Creek Gulch, five miles southwest of the town of Cripple Creek, and at an elevation of one and a half miles above sea level. The upper end, or "face," of the tunnel is under Battle Mountain, a mile north of Victor. Throughout its length the tunnel has a fall of 3 ft. in 1,000 ft. It has several important branches and is connected by "raises" with four of the principal shafts, the El Paso, Elkton, Cresson, and Portland. One branch connects with the Cresson shaft 2,000 ft. below the surface, while another, 2,000 ft. long, connects with one of the Portland shafts half a mile below the surface. If found necessary the tunnel may later be extended to the Golden Cycle shaft.

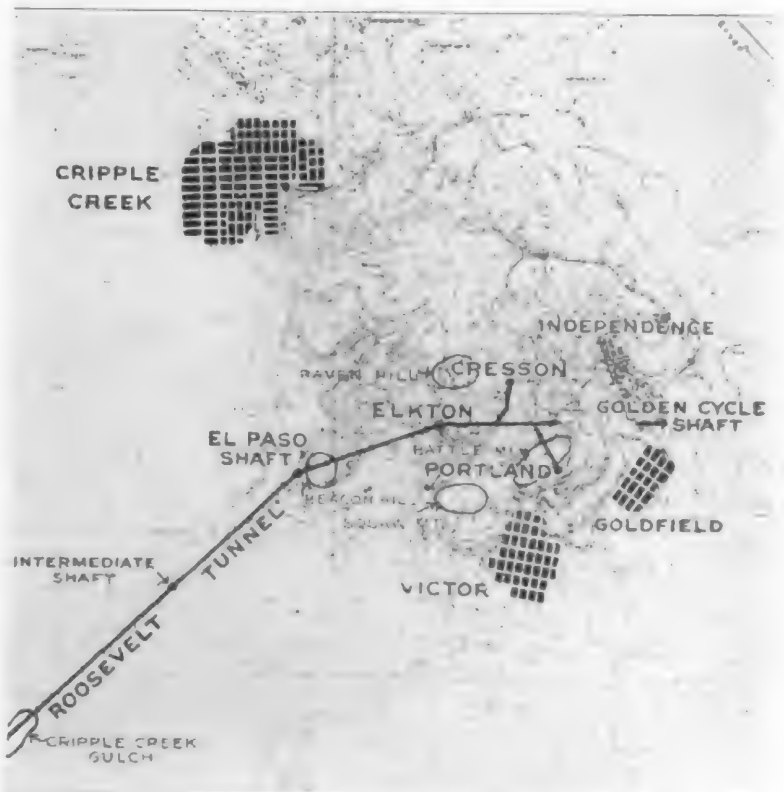
An idea of the work done by the tunnel is given by the daily records of water discharged from the portal. The maximum discharge occurred in 1916, when for three months the flow averaged 17,000 gal. per minute. By the end of 1918, this had declined to 2,500 gal. per minute, indicating that the mass of the water


742

0 Feet below the Surface, and Branches Connect It with the Cresson, Portland, and Other Shafts at Levels
ple Creek Gulch, Indicated at the Right, a Mile and a Half above Sea Level, Its Upper End Being
en Looking South, and Reverses the Locations on the Map

had been drained from the district. Calculations based on these records show that about 40,000,000,000 gal. of water has been discharged through the tunnel since the beginning of the construction work.

Plans for the big drainage project were laid as early as 1906, and construction actually started in 1907; but even at that time the El Paso drain was already in existence, having been completed in 1903. The function of this earlier bore was to unwater the western portion of the field. The El Paso tunnel, however, operated only to the 880-ft. level, and soon proved inadequate, though it greatly increased values at the time. The new work just completed cost practically $1,000,000, and the drainage problem has been solved once for all. Mining operations as deep as the tunnel will never again be seriously hampered by water. Shafts sunk deeper than this will no doubt encounter water in large quantities, but this will have to be pumped only to the tunnel level, an inconsiderable task compared with the additional lift of a sheer half mile that would be necessary if only surface drainage was available.




Course of the Tunnel through the Field, from Its Upper End at Battle Mountain to Its Portal at Cripple Creek Gulch, Indicating Branches and Shaft Connections: The Bore may be Extended Later to the Golden Cycle Shaft



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## MIDGET TRACTOR SAVES TIME AND LABOR AT AIR STATION

A small endless-tread tractor has come to be one of the most valued bits of equipment used about a large naval air station. Thus, while the task of moving a boxed seaplane from flat car to warehouse formerly kept 40 men busy for an hour and a half, with the little tractor at work the big boxes are dragged off the cars and hustled into the shops in 15 minutes. Powered with a 60-hp. engine and geared low for just such work, the machine moves a load of five tons with ease.

This Powerful Little Endless-Tread Tractor Pulls the Boxed Seaplane off the Flat Car and Pushes It into the Warehouse in 15 Minutes. Forty Men Formerly Required an Hour and a Half for the Same Job

## ELECTRIC SMELTERS PLANNED FOR DUTCH EAST INDIES

Hydroelectric plants may be built in Celebes, an island in the Dutch East Indies, to furnish current for electric smelters planned to handle the iron ore recently discovered there in large quantities. The use of coke is being considered, but is not as favorably regarded as electricity generated by water power. Preliminary surveys of the deposits indicate that there are 5,000,000 tons of surface ore and 155,000,000 tons of clay ore available, with the possibility that there are 7,000,000 tons of the former and 206,000,000 tons of the latter, a total of 213,000,000 tons. All of the ore is within 45 ft. of the surface, and can be removed without great cost, if it is found practical to harness some of the numerous streams on the island.

## AMERICAN SUBMARINE SINKS AND DROWNS THREE

The sinking, suddenly and without warning, of the American submarine "G-2," with its crew of nine men, off Waterford, Conn., recently, adds another to the navy's list of mysteries. Three of the crew were lost, the rest being saved by a coast-guard cutter. Observers stated that the floating ship, which was of an obsolete type launched in 1912 and was being used in depth-bomb experiments, went down stern first, lifting its bow 10 ft. in the air. The sinking occurred just after the officers and men had boarded it, and it is thought that the hatches may have been left open.

## HORSES STILL IN SERVICE IN NATION'S CAPITAL

In these days of transatlantic aeroplane flights, automobiles, and other swift features of modern transportation, a horse-drawn vehicle for the conveyance of passengers is something to make the average person look twice. There are few hacks and cabs operating in the larger cities of the United States, but in Washington, D. C., it is not uncommon to see dozens of carriages, cabs, and hacks, drawn up at a railway station, waiting for passengers, in competition with the gasoline-propelled taxicabs. Sight-seers quite frequently choose the slower vehicles for a leisurely tour of the nation's capital.

The Colored Man Driving This Cab Declares That He has been a Coachman in Washington for the Last 40 Years. He Declines to Give the Age of the Horse He Drives

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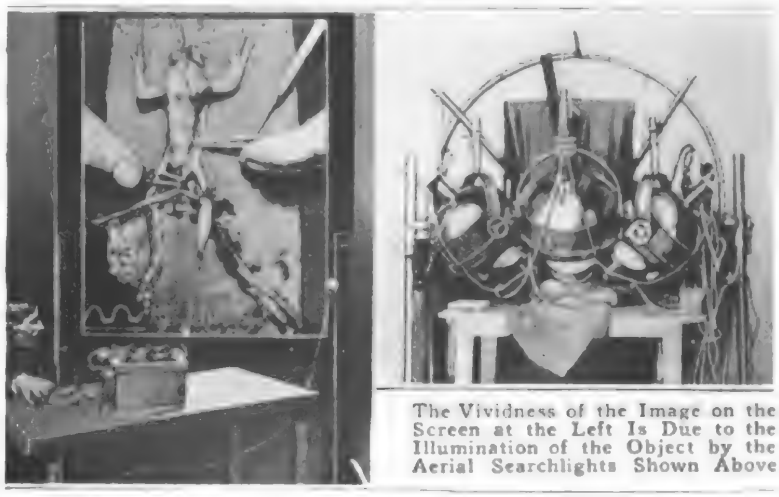
## DISSECTION WORK PROJECTED WITH AERIAL SEARCHLIGHT

An improved apparatus for projecting dissection work upon the screen has been installed in one of the large classrooms of a famous French university at Paris. The rat, frog, or similar animal to be experimented on, is pinned on a table between the hands of the demonstrator. A foot and a half above the table is an object glass surmounted by a large reflecting prism which projects a picture of the operation on the screen, permitting every member of the class to follow it in all its details. The lighting system is the novel feature of the installation. Three great anti-aircraft searchlights, of 5,000 cp. each, throw a brilliant light on the subject. It has been found that they radiate far less heat and give a more satisfactory light than the electric arcs usually employed for this purpose.



The Vividness of the Image on the Screen at the Left Is Due to the Illumination of the Object by the Aerial Searchlights Shown Above

## BERMUDA-NEW YORK RECORD BROKEN BY SUB CHASER

In spite of unfavorable weather, a new motorboat record for the trip between Bermuda and New York City was established by the submarine chaser "SC-131," winner of the recent island-to-metropolis race participated in by six gasoline-propelled vessels of that classification. The official time of the "SC-131" was 57 hr. 20 min., which is considerably less than the former record, 88 hr., made by the motorboat "Dream" in 1918. Two other chasers, the "SC-217" and the "SC-351," finished the race within an hour after the winner, but the remaining three came in several hours later than the leaders. All of the boats were on duty in the Mediterranean Sea during the war, and each cruised more than 20,000 miles in the eastern waters. The winning craft is 110 ft. in length.

These Patient Colombian Shipbuilders are Hewing Their River Craft from a Single Giant Trunk. The Job Requires Months of Toil with Adz and Chisel

## PRIMITIVE SHIPYARDS FOUND IN COLOMBIA

The natives in the interior of Colombia, South America, still use the picturesque dugout, carved from a single log, to convey their bananas and other produce to market. Four workers are shown in the illustration busy on a typical 18-ft. canoe which has not been moved since it was felled at the river bank. Such construction is necessarily slow, involving months of constant toil with adz, maul, and chisel. When finished, the craft will be owned by three partners who will also be the crew, two working at the paddles while the third uses a long pole in the rear.

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¶ Reports on road conditions are being included in the weather bulletins for some states issued by the U. S. Department of Agriculture, and the new service is to be extended as rapidly as possible.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## MOVABLE TRANSFORMER COIL REGULATES WELDING SET

In a new electric arc-welding set, the arc is made adaptable to various classes of work by means of an adjustable transformer. The secondary coil is attached to a vertical rod which extends through a bushing in the top of the case. A rack cut on the rod engages a pinion on a handwheel shaft, and by turning the latter the relations of the primary and secondary coils are changed to suit the amount of current required for the job in hand, the arc electrodes being changed to correspond. The transformer is of sectional-unit construction, and may be enlarged as the demands upon it increase.

By Turning the Handwheel on the Transformer Case at the Left, the Secondary Coil is Shifted in Its Relation to the Primary, Adjusting the Current to the Needs of the Welding Arc That the Operator at the Right is Using

## PRODUCT OF DOMESTIC TREE RESEMBLES ORIENTAL GUM

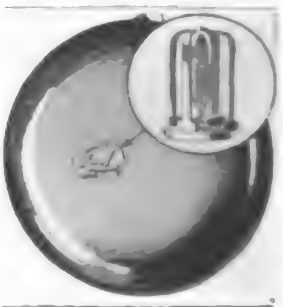
Laboratory experiments are being conducted by the Forest Service to determine to what extent a honeylike substance obtained from the red-gum tree, common in the South, can be utilized as a substitute for storax, a somewhat similar material imported from far-eastern countries, and used in the manufacture of perfumes, court-plaster, and other articles. Interest in the subject was aroused as a result of the war, which curtailed the importation of the foreign product. A considerable quantity of the domestic gum has been gathered and sold for $2 a pound.

## DISTANT TEMPERATURES READ BY ELECTRIC THERMOMETER

Temperatures at different points about a plant are indicated or recorded at the office or other central location, by means of a new electrical thermometer. The range of the instrument is very wide, extending from 328° F. below zero to 1,004° above. The thermometer element is a coil of platinum wire on a porcelain spool, about 2 in. long and 7/16 in. in diameter, covered with a glaze and protected by a metal sheath. This coil is connected as one arm of a Wheatstone bridge, whose three remaining arms are unaffected by temperature changes. The galvanometer of the bridge is mounted on the central switchboard, and may be calibrated at any time by substituting, with a test plug, a standard resistance for the platinum coil. For permanent records, the galvanometer is connected to an instrument whose needle is depressed at intervals, making ink dots on a moving thread.

## FUSE CONTROLS MECHANISM OF NEW FIRE ALARM

Controlled by a metal fuse which melts at 165° F., a new fire alarm is operated by a spring-actuated mechanism incased in a gong. The device is intended for homes, but can be used in stores or factories. It is installed on the wall near the ceiling. In case of fire, the fuse melts, releasing the catch which locks the ringing movement. The bell rings five minutes before the spring is unwound. To reset the alarm, it is necessary only to replace the melted fuse with a new one, and to wind the spring by turning the gong. The contrivance is sold at a low price.



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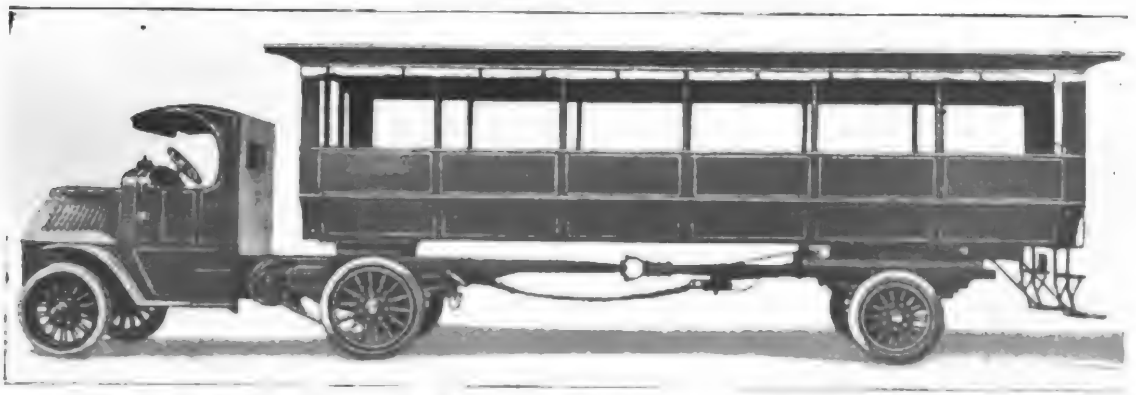

Employes of an Oil Company in a Southern State Ride to and from Work in This Huge Trailing Bus, Which Has a Seating Capacity of 80 Persons. The Body Is 25 Feet Long, Eight Feet Wide, and Six Feet High. Inside Are Four Longitudinal Benches

## BIG TRAILING BUS CARRIES EIGHTY PASSENGERS

Eighty passengers can be seated in an enormous truck-trailer body used by an oil company in a southern state for conveying employes to and from their work. The bus is 25 ft. long, 8 ft. wide, and 6 ft. high. It has four longitudinal benches. Steps at the rear facilitate loading and unloading. The sides are fitted with roller curtains. A fifth wheel, or turntable, near the rear of the truck, which has a very short wheelbase, bears the weight of the front portion of the trailer. Through an extension rod from the truck, and another from the axle of the trailer, connected by a universal joint, the wheels under the rear of the body are turned in the same manner as the front wheels of a wagon, and track with the rear wheels of the truck. This allows short turns to be made. Two chains, fastened to the sides of the truck frame and connected with a singletree on the extension pole of the trailer axle, bear the pulling strain.

## HEAVY AUTOMOBILE TRAFFIC ON LINCOLN HIGHWAY

Automobile traffic on the Lincoln Highway is considered to be heaviest in the vicinity of Jersey City, N. J., where recently 11,000 motor vehicles on the transcontinental road crossed a bridge over the Passaic River, west of the city, in 14 hours. Of this number 10,610 were passenger cars, and 390 trucks. The figures mean that more than 780 machines passed over the structure every hour, and that the average was over 13 for each minute of the period. Only 65 horse-drawn vehicles used the bridge while the count was made.

## LUMBERMEN USE AIR MOTORS FOR ROTATING AUGERS

Pneumatic motors have been adopted by the lumbermen of the Northwest, who equip them with long augers for boring holes in the enormous logs that are used in making donkey-engine sleds. Two men are required to handle each machine, which penetrates the wood to which it is applied with remarkable rapidity. Because of this labor-saving device, ten sleds can be constructed in the same time required to complete one by the old hand-tool method.

Boring Holes with an Air Motor: The Machine is Driving an Auger through One of the Big Logs Used in Building Donkey-Engine Sleds

¶Pineapple growing has become an American industry of sufficient importance to have a growers' association, which has just been organized in St. Lucie County, Florida.

## USEFUL ARTICLES COMBINED IN CARVED FURNITURE

An ordinary pocketknife was used by an eastern man to carve an elaborate piece of furniture which comprises several useful articles. It required over a year to complete the work, which was done during spare moments. Pyramidally placed on a player-piano music-roll cabinet are a fireproof safe, an eight-day clock, a music box, and a miniature Statue of Liberty. Each section can be used separately. Inclosed in the base of the statue is a battery which furnishes current for lighting bulbs on the four posts at the corners of the base, and in the upraised hand of the figure. The ensemble is 8 ft. 6 in. high, and is finished to resemble mahogany.

Using His Spare Time for Over a Year and Working with an Ordinary Pocketknife, an Eastern Man Produced This Elaborately Carved Piece of Furniture

## AUTOMOBILE USED AS LOCOMOTIVE FOR LABORERS' TRAIN

Fifty laborers were transported to and from their work on a novel train during the construction of a 70-mile railroad line, recently completed between Laurel and Rapelje, Mont. Flanged wheels were procured and fitted on a powerful automobile, which was placed on the rails, and the machine served as a locomotive. Six small, four-wheeled flat cars were used, the men sitting or standing on these. A reasonably fast schedule was maintained by the gasoline-propelled train. The new railroad runs through a rich dry-farming district, which will be greatly benefited by the line.

## ENORMOUS HARBOR IS PROJECTED AT ITALIAN SEAPORT

Famous now as the birthplace of Columbus, picturesque Genoa, Italy, is destined to become noted for the completeness and size of its harbor facilities. Plans have been made for the improvement and enlargement of the port, to cost nearly $58,000,000, and to require 20 years for completion. Extensive jetties and quays will be constructed; railroad lines will be built to facilitate the loading and unloading of ships; great warehouses will be erected, and large areas near the water front will be set aside for industrial plants. The latter provision will make possible the shipment by water of manufactured products without long hauls between factory and seaport. One of the basins to be improved, when completed, will have a water surface that will measure more than 247 acres, and will be inclosed by nearly 6,000 yd. of shore walls.

Automobile-Drawn Laborers' Train on a Recently Completed Montana Railroad: Fifty Men Rode on the Six Small Flat Cars Attached to the Motor Vehicle, Which was Fitted with Flanged Wheels. Fast Time was Made by the Gasoline-Propelled Train

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American Soldiers Studying Art in a Public-School Building in Coblenz, Germany: Their Model Is a Little German Girl. Lacking Easels, the Men Use Chairs to Hold Their Canvases and Drawing Paper

## AMERICAN SOLDIERS UTILIZE GERMAN SCHOOL BUILDING

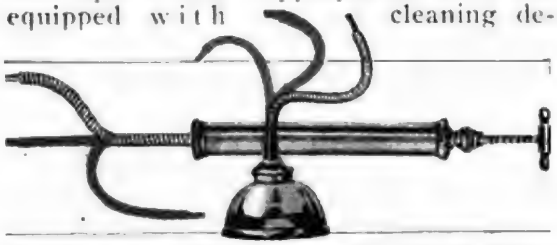
Deserted by pedagogues and pupils of Teutonic birth, a large public-school building in Coblenz, Germany, is used by American soldiers for the study of art, history, mathematics, mechanical drawing, and other subjects. Instruction in free-hand drawing and painting is given five nights in each week. Some members of the nocturnal art classes have made plans to take more advanced courses later in Paris and elsewhere. Many of the posters used by the army in the occupied zone are the work of these soldier-students.

## TRADE USE OF WORD "ANZAC" IS BARRED BY REQUEST

Use of the term "Anzac" by manufacturers and dealers as a trade name has been interdicted by Great Britain and all its colonies, and a few American concerns which had adopted the word have been requested by the Australian commission in the United States to discontinue its use. As is well known, the word is formed from the initials of the Australian and New Zealand Army Corps. The wonderful deeds of that organization in the war have given the coined name an almost sacred significance to its native lands, where the thought of commercializing it is extremely distasteful.

## FLEXIBLE OILCAN SPOUTS BEND TO ANY SHAPE

Flexible steel spouts for oilcans and grease guns are recent innovations. With these it is easy to apply lubricant to bearings that are difficult to reach with the ordinary devices used for this purpose, as they can be bent into any shape desired. The spouts are copperplated, and are equipped with cleaning devices which remove particles that interfere with the flow of oil or grease. They are especially useful on automobiles.



Grease Gun and Oilcan Fitted with Flexible Spout: Bearings Ordinarily Hard to Reach can be Lubricated with These Devices

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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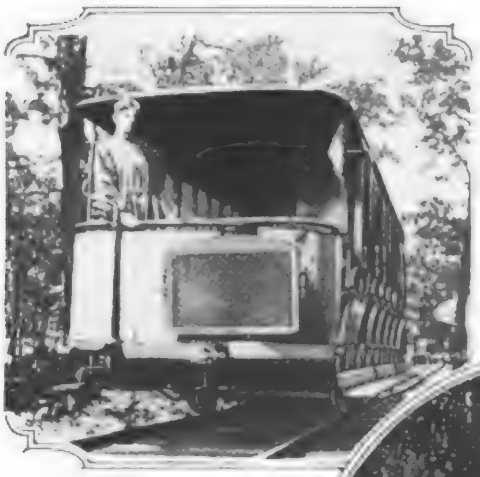
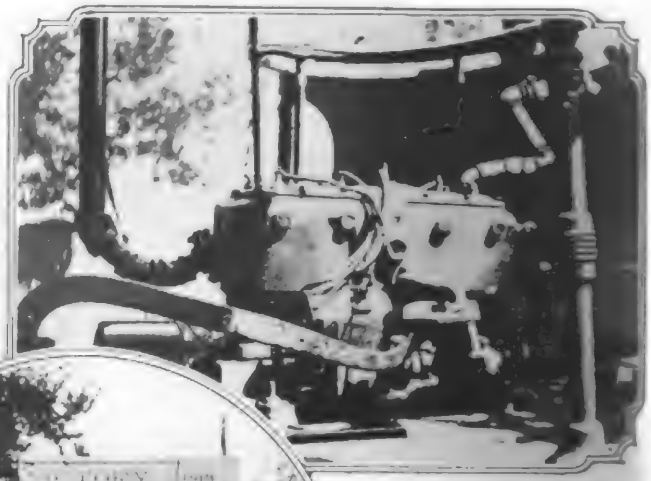
# CIVIC FEATURES THAT PROMOTE THE COMFORT



Propelled by an Automobile Motor, This Old Street-Car Trailer Makes Three Round Trips Daily between the Railroad Station at Lakewood, Michigan, and a Summer Resort on a Lake, Five Miles Away



This Gasoline Engine is Geared to the Front Truck of the Trailer. At the Left of the Picture Is the Exhaust Pipe, Which Extends through the Roof. The Radiator is Fastened in Front

Returning Soldiers Who Disembark at Newport News, Virginia, are Greeted by an Artistic Arch through Which They Pass While Marching from the Ship to a Camp near the City

Heavy Traffic Damaged the Elevated Wooden Streets of Port Angeles, Washington, to Such an Extent That the Centers of the Thoroughfares Became Unsafe. Automobiles are Now Parked over the Worn Sections, Leaving the Unworn Sides for Moving Vehicles. Piling Supports the Streets over Tide Flats

Pedestrians Avoid a Dangerous Railroad Crossing in Los Angeles, California, by Walking under the Tracks through a Tunnel, Which is Reached by a Sloping Sidewalk. The Floor of the Tunnel Is About 10 Feet below the Level of the Rails



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# AND ENJOYMENT OF VISITORS AND RESIDENTS

A Memorial to the First Newspaper Printed West of the Rocky Mountains: The Tablet is Set in a Massive Bowlder in Oregon City, Oregon

Wisconsin Shows Its Appreciation of the War Services of Its Citizens by a Huge Electric Welcoming Sign Encircling the Dome of the Capitol at Madison. The Sign Is Eight Feet High and 308 Feet in Circumference. It Contains 2,850 Lights

Motorists Rarely Speed by This Novel Warning Sign on the Lincoln Highway near the Texas-New Mexico Border. The Skull and Crossbones, Combined with the Reference to a Cemetery, Speaks Plainly of the Dangerous Hill Ahead

In a Public Park at Pasadena, California, Picnic Parties may Rent Lockers in Which to Leave Lunch Baskets, Coats, and Other Articles. Padlocks Guard the Contents of the Boxes, Which are Made of Heavy Galvanized Netting. A Roof of Palm Leaves Shelters the Novel Convenience



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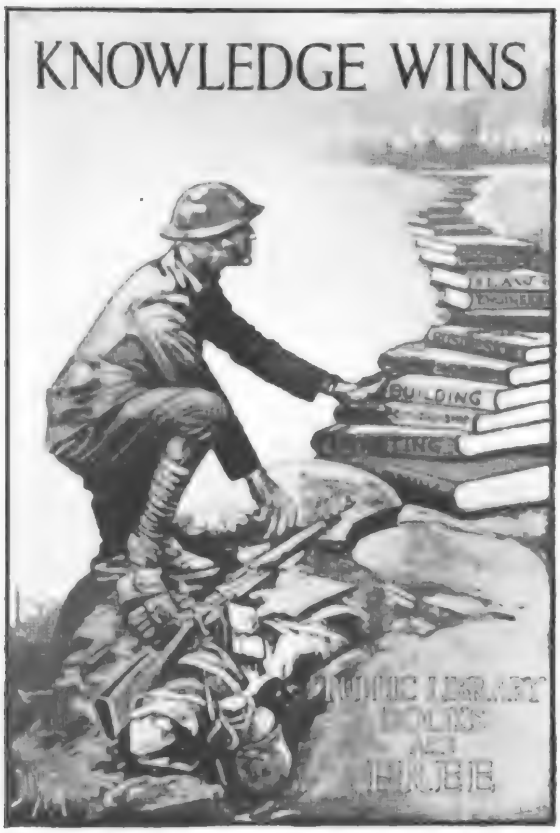
## VOCATIONAL-TRAINING BOOKS FOR EX-SERVICE MEN

In cases where public libraries are not available, books are to be lent to dis-




**With This Poster the American Library Association is Endeavoring to Increase the Demand for Books among Ex-Service Men**

charged soldiers, sailors, and marines by the American Library Association, which provided reading matter to service men in home camps and overseas during the war. Volumes will be sent anywhere by the organization upon the receipt of requests. Special efforts are being made to increase the demand for works on vocational subjects. As part of the campaign to this end, posters are being distributed throughout the country. One, which makes a powerful appeal, is called "Knowledge Wins." It depicts a soldier, fully equipped, climbing out of a trench on a stairway of books that leads to a city of tall buildings and busy factories, typifying success.

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¶Tanned goat skin, the "kid" of the shoe trade, is bringing around $1 a square foot, which weighs about four-fifths of an ounce. Waste in cutting brings the value per ounce up to $1.50, or so. Silver bullion still sells at $1.07 an ounce.

## OIL-SOAKED SAWDUST KILLS LARVÆ OF MOSQUITOES

Oil-soaked sawdust destroys the larvæ of mosquitoes if scattered broadcast over inundated rice fields, but does not harm the grain crop, according to a bulletin issued recently by the United States Public Health Service. In an experiment conducted on an Arkansas farm, about three gallons of fuel oil was used for each bushel of sawdust, and two treatments destroyed all larvæ in one field. A thin film of oil is spread uniformly over the surface of the water by this method. Drip cans were tested, but found unsatisfactory because of the uneven distribution of oil, which damaged the growing rice.

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## MOVIE FILMS OF POTATOES SHOW "LEAK" DISEASE

Motion pictures of diseased potatoes have just been prepared by the U. S. Department of Agriculture for the benefit of growers, particularly in California, who are having trouble with so-called "leaky" tubers. The films show the progress of the malady from the infection, when the vegetable is wounded by hoe or fork, or by breaking off one of its "knobs," until it becomes a soft, spongy, decayed mass. The pest is of the fungus variety, and very active in attacking injured potatoes.

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## ALUMINUM PEDAL OPERATES AUTO FOOT THROTTLE

Fatigue resulting from manipulating the ordinary foot throttle of an automobile is made a thing of the past by a new contrivance, according to its manufacturers. This is an aluminum pedal, pivoted near one of its ends on a base intended to be fastened to the floor alongside the regulation type of accelerator so that one end of the pedal bears lightly on the foot lever. To operate the device, the foot of the driver is rocked from side to side, while resting comfortably on the pedal. Corrugations on the surface of the pedal, and a guard at one end, prevent the foot from slipping.

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## POLICE WILL INDEX CRIMES ON SPECIAL CARDS

Crimes will be indexed according to their outstanding features by the police department of New Orleans on cards provided especially for that purpose, and search for the perpetrator of a certain misdeed will be narrowed down to seeking for criminals whose characteristic methods are described by the record of that particular illegal act. This system is based on the generally accepted theory of criminologists that each criminal has a peculiar way of committing a burglary, robbery, or other crime. Each serious violation of the law will be indexed thoroughly. A complete description of the crime itself will be given in each case, including the location and the hour it was committed, while the demeanor of the criminal will be recorded, as well as other details bearing on the matter. The southern city will be the first in this country to test the system, it is stated.

## BATHTUB FIXTURE COMBINES SUPPLY AND OVERFLOW

A bathtub fixture recently placed on the market provides for the admission of hot and cold-water supply pipes and an overflow drain pipe through a single hole in the end of a tub. The water-supply pipes enter the overflow pipe from either side of the elbow joint at its upper end. Inside they are bent to extend through the center of the drain pipe to the combination faucet, to which they are connected. Another feature of the fixture is an expanding metal washer which is used at the connection of the bottom drain with the tub.

## PORTABLE ARCHES SIMPLIFY CONCRETE BRIDGE MAKING

The elaborate scaffolding and falsework hitherto necessary for building concrete bridge arches is wholly eliminated by a patented method used by an eastern steel concern. The bridge piers and abutments are first completed, with brackets seated upon their sides. Portable arches of steel, hinged at the center, are then lowered by derricks into position between the brackets. On these the forms are erected, reinforcing installed, and the concrete poured. When it has set, the steel arches are lowered into barges, by winches operated on the completed bridge span, and moved to the next span, or another job. The hinge allows some latitude in the length of span one set of temporary arches can handle, by slightly changing the form of the opening.

The Portable Arches Rest upon the Brackets on the Bridge Abutments, and Take the Place of Expensive Falsework

## USE MODEL GRAIN ELEVATOR TO SHOW FIRE DANGER

How destructive fires are started by dust explosions was demonstrated recently to 300 boy scouts at Spokane, Wash., by means of a miniature grain elevator, with which such a disaster was staged on a small scale. The fire-prevention committee of the local chamber of commerce had charge of the exhibition, which was given with the idea of impressing upon the youths the danger of untidy buildings, and to instruct them in methods for reducing the danger of conflagrations. Further instruction was given with moving pictures.

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Fig. 1. Showing the Use of the Tool Illustrated in Fig. 2

Fig. 2. Tool for Removing Valve Springs

Fig. 3. Valve Spring Lifter

Fig. 4. Another Valve Spring Lifter

Fig. 5. Valve Spring Lifter Applied to Engine

Fig. 6. Valve Spring Lifter

Fig. 7. Valve Spring Lifter Applied to Engine

Fig. 8. Valve Spring Lifter

Fig. 9. Valve Spring Lifter Applied to Engine

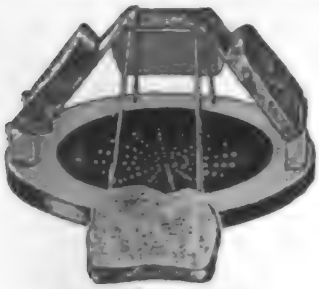
Fig. 10. Valve Spring Lifter

Fig. 11. Valve Spring Lifter Applied to Engine

Fig. 12. Valve Spring Lifter

Fig. 13. Valve Spring Lifter Applied to Engine

# INTENDED FOR THE HOME AND ITS MEMBERS



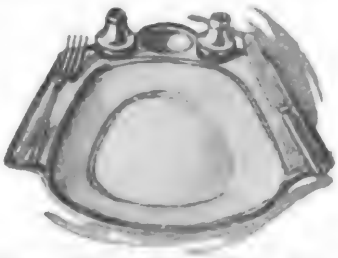
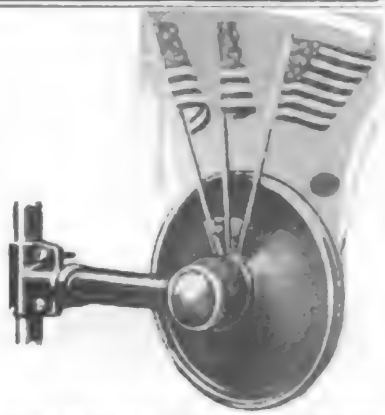
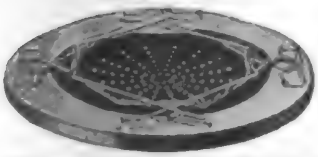


Plate Designed to Hold Knife, Fork, Salt and Pepper Shakers, and Butter Dish, in Addition to Food



Automobile Searchlight, Road Mirror, and Flag Holder in One Accessory: The Bracket Is Adjustable, and Fastens on the Windshield Frame near the Driver's Seat

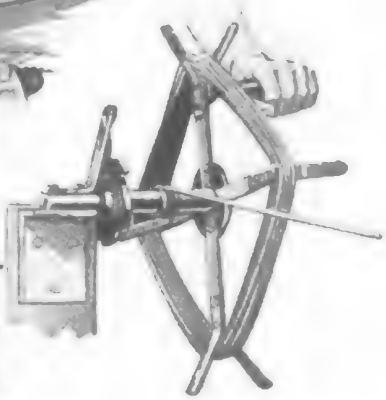


Protected from the Flame by a Perforated Shield, Slices of Bread are Evenly Browned When Placed on the Wire Racks of This Folding Gas Toaster

A Recent Novelty in Household Furniture Is a Combination Library Table and Writing Desk, the Latter Built in at One End of the Former, and Disclosed, Ready for Use, by Raising a Hinged Section of the Table Top

Made Entirely of Steel, a New Vacuum Bottle cannot be Broken by Rough Handling or Changes of Temperature. Above Is a Sectional View, Showing Its Construction

Simple Removable Guard for Converting an Ordinary Razor into a Practical Safety Razor



Clothesline Reeland Tightener: Rope is Wound on the Forked Arms, or Tightened by Winding on the Axle of the Wheel



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## IMMOVABLE PARK BENCH BUILT OF CONCRETE AND STEEL

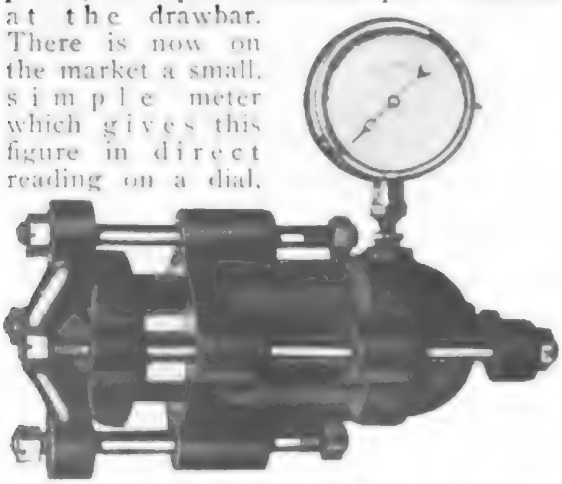
Caretakers of Philadelphia's public parks are pleased with the introduction

This Picture Shows in Phantom the Underground Portion of an Immovable Concrete and Steel Park Bench Designed by the City Architect

of an immovable park bench. In the past they have been compelled to spend a part of each day redistributing the light steel benches, moved from their proper places during the preceding evening. Some were actually stolen. The new bench cannot be moved, however, as the heavy frame of concrete and steel is sunk 17 in. into the ground. Wooden strips are bolted to the frame to form seat and back.

## DRAWBAR PULL REGISTERED BY SIMPLE MACHINE

The work capacity of a tractor depends not only upon its weight or horsepower, but upon the actual pull it exerts at the drawbar. There is now on the market a small, simple meter which gives this figure in direct reading on a dial,

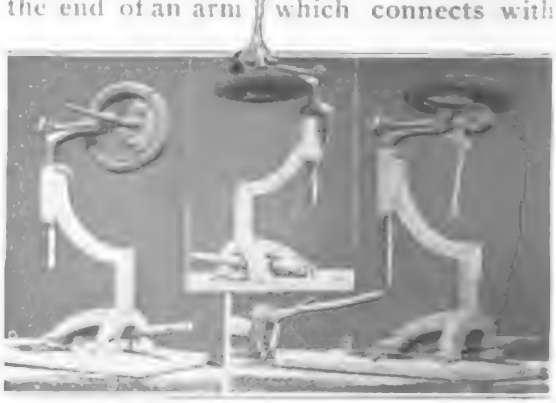


Instrument for Giving Direct Reading of Drawbar Pull or Draft Up to 10,000 Pounds: The Cylinder is Filled with Lubricating Oil

and the operator is enabled to determine at a glance the power of any pull up to 10,000 lb. The mechanism consists of a heavy piston in a cylinder filled with oil, working on the hydraulic principle. The instrument, weighing 75 lb., has only two moving parts and no springs, and may also be used for weighing, or to indicate the draft between any power and its load.

## NEW ADJUSTABLE TIRE LAST INVENTED FOR GARAGES

Tire casings are held in convenient position for repairing by an adjustable bench last recently patented by an Ohio inventor, who declares that it will be found valuable in garages and shops where tires are mended. A notched rod running through the upper part of the stand, which supports the device at about the proper height, allows vertical adjustment, while the last, or form itself, fastened at the end of an arm, which connects with



Three of the Many Convenient Positions to Which a New Bench Tire Last can be Adjusted for Repairing Casings

the notched rod at right angles, can be adjusted to hold a tire in four different positions. Wire fasteners hold the casing firmly on the form.

## TRAPPERS FEED WILD-ANIMAL CARCASSES TO POULTRY

Though meat, cooked and ground, is known to be a good poultry food, few farmers use it since all meats have entered the luxury class. The number of farmers who trap wild animals for their pelts, however, is growing as the price of furs continues to ascend. Now some of the alert individuals who are combining the two vocations have found that the flayed carcass of fox, skunk, or muskrat, suitably prepared, is as welcome a titbit to poultry as good beef. Thus is another former waste product put to advantageous use.

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# A RING SUNRISE

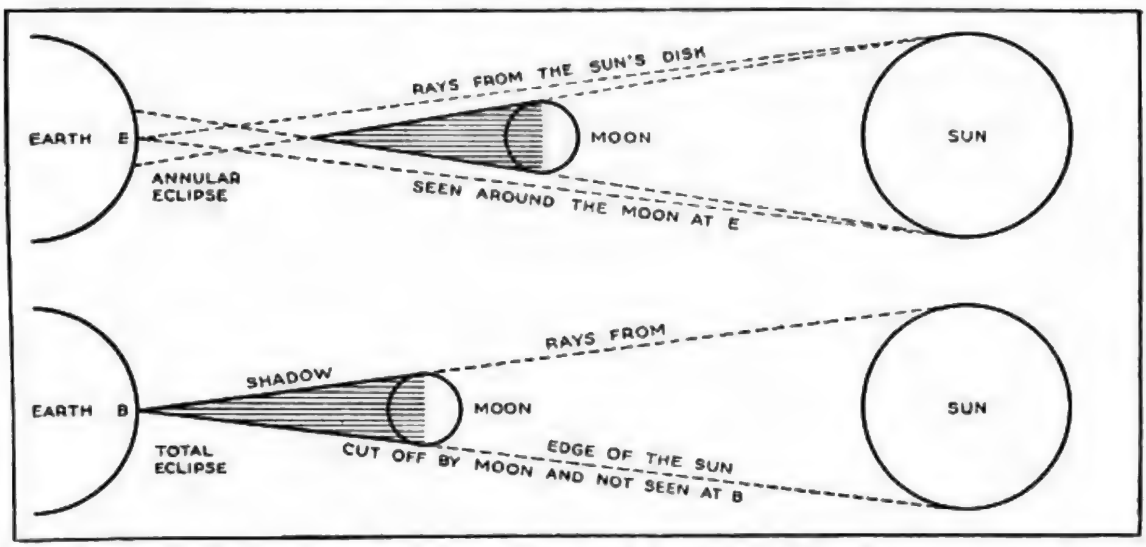
By Latimer J Wilson

Annular Eclipse of the Sun, as It will Appear to Observers in Parts of the United States on the Morning of November 22, 1919: The Ring Effect Occurs Because the Moon, at the Time of the Eclipse, Is at Its Greatest Distance from the Earth, and Its Visual Angle Is Too Small for a Total Eclipse

THE unusual phenomenon of an annular, or "ring," eclipse will be visible in the United States on the morning of Nov. 22, 1919. The central path of the eclipse extends from the vicinity of Timbuktu, Africa, across the Atlantic Ocean to a point near San Antonio, Tex. The natives of the African jungle will behold the sun going below the horizon as a great ring of fire, while the inhabitants of the Texas plains will see his majesty, "Old Sol," come up above the sheets of morning mist in the same curious form.

When the moon passes directly across the face of the sun as seen from a position on the earth, an eclipse occurs. By a coincidence the moon is very nearly the size of the sun as seen in our sky, though in reality it is only about one four-hundredth the diameter of the solar disk. The moon's distance is such that the planet ordinarily appears about as large as the sun, 93,000,000 miles away. But for this remarkable circumstance, we would never see the sun sometimes completely hidden by the moon and at other times not quite screened by the opaque body of our satellite. Thus we can have either a total eclipse of the solar disk or an annular eclipse.

If the earth's atmosphere extended out-




The Upper Diagram Explains the Reason for the Annular Eclipse When the Moon Is at Its Greatest Distance from the Earth, So That the Shadow Cone does Not Reach the Earth; the Lower Diagram Shows How a Total Eclipse is Formed by the Shadow Cone Striking the Earth's Surface When the Moon is Nearer



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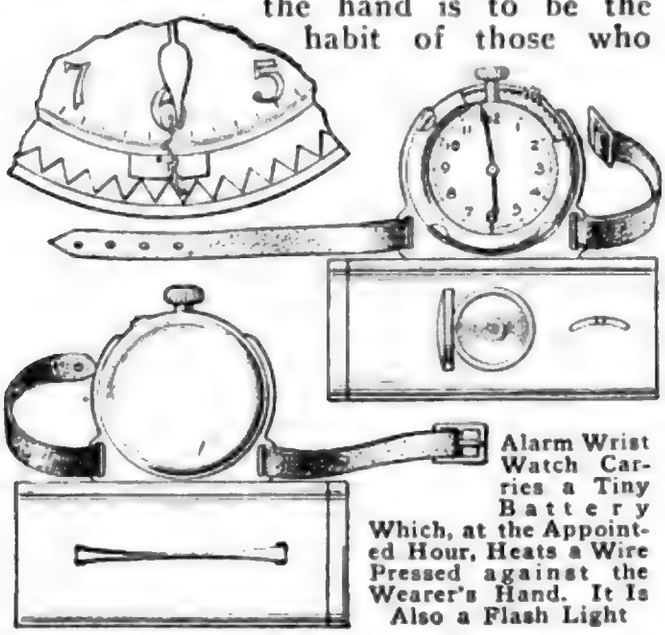
ward to the distance of the moon we could see the long conical shadow cast by the moon. When our weird satellite is at its near approach to the earth, its orbit being slightly eccentric, the tip of the shadow cone touches the ground and marks a narrow path of totality. The shadow may be large enough for the period of totality to last nearly seven minutes. Such was the duration of the total eclipse of May 29, this year.

But when the moon sweeps across the solar disk at a distance from the earth too great for the tip of its shadow cone to touch the surface, the phenomenon of an annular eclipse occurs. Sometimes both types of an eclipse may occur during the same event, the moon's distance varying enough in the course of its passage to change the character of the eclipse, the ring of fire either fading into blackness or growing out of it.

## WRIST WATCH WAKES WEARER WITH SILENT ALARM

To be awakened by the pressure of a bit of warm metal against the back of the hand is to be the habit of those who



Alarm Wrist Watch Carries a Tiny Battery Which, at the Appointed Hour, Heats a Wire Pressed against the Wearer's Hand. It Is Also a Flash Light

adopt a recently designed alarm wrist watch. Fastened alongside the watch is a miniature electric dry battery in a case upon whose back is stretched a small piece of resistance metal. The contacts are set for any desired hour by turning a knob on the watchcase. When the circuit is made by the hour hand of the watch, current flows through the resistance strip resting against the wearer's hand and the rise of temperature awakens him. A tiny lamp bulb on the case makes it also a flash light.

## PAINT MALARIAL MOSQUITOES TO FIND RANGE OF FLIGHT

During experiments in malaria control conducted by the U. S. Public Health Service among the rice fields of Arkansas, it became desirable to measure the flight range of the germ-bearing mosquito. About 5,000 mosquitoes were captured and put into glass containers closed with screen. Then, with an atomizer, the captive insects were liberally sprayed with a one-per-cent solution of methylene blue. Some 4,000 survived this treatment, and were liberated at a central point. Starting 60 hours later, recatches were made at 37 different points. Only 10 painted specimens were recaptured, one a mile from the point of release, and nine three-fourths of a mile.

## SELECT FOOD BY HEAT UNITS, LIKE COAL, IS ADVICE

Foodstuffs should be retailed at prices based on the number of heat units they contain, instead of by weight or measure, in the opinion of the commissioner of labor statistics. This would enable the consumer to select at all times the most economical menu calculated to yield the necessary 3,000 calories per person per day, and so help to control the cost of living. Even supposedly constant food items—like bread, meat, and potatoes—vary considerably in their caloric content, and price is little indication of value.

## FOOT-STRENGTHENING DEVICE SERVES THREE PURPOSES

An appliance for the relief of sufferers from "dropped foot," an affliction characterized by the practical collapse of the feet, has been designed by an English manufacturer of shoes for cripples. It is intended to support the arch of the foot, to brace the ankle, and to lift the toe, thus enabling the patient to walk with comparative ease and comfort. A flat iron frame, shaped to be placed under the arch of a shoe and extend nearly to its top on both sides, is fastened to the outside of the shoe by a strap and two coil springs. The former

BY COURTESY OF THE LANCET LONDON

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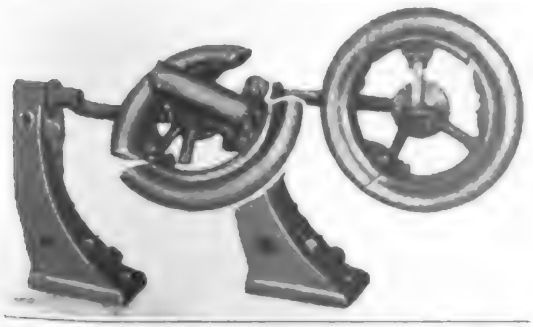
passes through slots in the frame and over the back of the footwear, while the latter are attached to the ends of the frame and secured to the shoe near the lower end of the laced opening.

## CAR-WASHING ESTABLISHMENT HAS LARGE CAPACITY

Automatic machinery installed in an enormous automobile-washing establishment, opened recently in an Ohio city, makes it possible for the employes to clean 320 cars in an eight-hour day, or, in other words, four every six minutes. Several steps are taken to complete the cleaning process, which includes thorough washing of every part of the machine, spraying the underside with kerosene and soap, rubbing the body with chamois skin, and removing dirt from cushions and floors with vacuum cleaners. Polishing is optional. Tracks guide the machines to proper positions for treatment with the various devices used. A large building is devoted exclusively to the work.

## COLLAPSIBLE CASING FORM MADE IN FOUR SECTIONS

An innovation in collapsible pneumatic-tire building forms is one made in four sections that are hinged on three radiating arms. One of the latter is a rack, arranged so that it can be moved by a pinion in the center of the device. Extended, the sections fit together to make a form over which rubber and fabric can be placed in layers. When the section attached to the rack is withdrawn from the circular shape, by manipulating the rack-and-pinion gear with a socket wrench, all the sections can be folded over, and the tire removed from the form without stretching or disarranging it.



Collapsible Tire-Building Form: On the Right the Device Is Ready for Use, While on the Left Its Sections are Folded

## PILOT'S GUN SWINGS FREELY YET CANNOT HIT PROPELLER

In the military airplane the pilot's machine gun is conventionally fixed to the fuselage so that he aims his weapon by "aiming" his entire ship. This is not the case, however, with a gun of recent patent, which may be turned freely on a universal bearing. Interest centers on the mechanism which prevents the gun from being discharged when a propeller blade is in the line of fire. Just below the gun barrel is a spherical segment, resembling a miniature propeller, and geared to revolve at the speed of, and parallel to, the airplane's propeller. Hanging in front of this segment is a small lever which actuates a locking rod running back to the trigger mechanism. In whatever direction the gun is aimed, the small lever will lock the trigger mechanism when in contact with the revolving segment. The gun will thus refuse to operate when a propeller blade is in the line of fire.

Airplane Machine Gun Which can be Aimed in Any Direction, but Which cannot be Discharged When a Propeller Blade Is in the Line of Fire

## CORRUGATED WASHER ON BOLT STRENGTHENS WOOD JOINT

A simple corrugated washer strung on the bolt that holds two timbers together has been found by a Swedish inventor to increase the shearing strength of the joint as much as 100 per cent. The washers, of all sizes, are $\frac{1}{16}$ in. thick, their corrugations $\frac{3}{32}$ in. high. They are strung on the bolts between the timbers to be clamped together, and the nut drawn up with a powerful wrench 2½ or 3 ft. long, to sink the teeth into the wood. Some 48 hours later, and again in about 72 hours, the tightening process is repeated.

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Toys Follow Developments in Larger and More Important Fields; One of the Latest Devices for Amusing the American Boy Is the Airplane Kite. It is Made of Light Wood and Silk, and Has Three Propellers Which Revolve When the Kite is Flown

Vegetation Develops Amazingly under the Tropical Sun of British India. In This Picture a Small Boy is Shown Seated on an Enormous Lily Pad near His Home in Madras. With Its Upturned Edges, the Great Leaf Becomes a Living Boat, Anchored by Its Stem, Which will Easily Float a Child. One of the Flowers can be Seen at the Left

Buckets Are Not Common in the Hawaiian Islands, and Bamboo Logs are Used in Their Place. This Little Girl is Carrying Water in One of the Primitive Containers



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Nimble-Fingered Japanese Children Find Interesting Employment in the Toy Factories of Their Native Land. This Group of Oriental Juveniles is Assembling the Parts of Tiny Warships, Many of Which are Sold in the United States

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Two Broken Arms Failed to Prevent This Smiling Youth from Making Noise on the Fourth of July. He Used a Heavy Tailor's Iron, Lifting It with His Foot, to Smash Toy Torpedoes

Though Not Particularly Beautiful, This Motor Car Runs, and That Is the Important Thing to Its Owner, the Chinese Boy at the Wheel, Who Helped Make Every Part of the Vehicle

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Joined Together since Birth, the 11-Year-Old Filipino Boys on the Velocipede are to be Separated Soon by an Operation. The Twins were Exhibited in an Amusement Park in This Country for a Time, and Later They Became Students in an Eastern School



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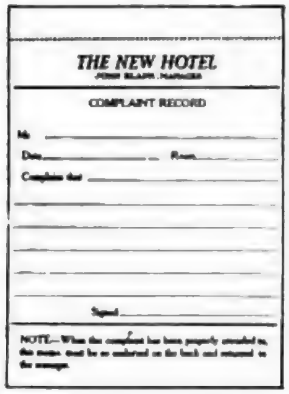
## HOTEL PROVIDES ENVELOPES FOR GUESTS' VALUABLES

Homelike conveniences and studious attention by the management to the comfort of patrons have built an enviable reputation for an Ohio hotel, in which unusual methods are employed to accomplish this result. One of these is a means for safeguarding the valuables of guests who habitually place their money and jewelry under their pillows at night. Large manila envelopes are placed in each room for this purpose. Printed on the envelopes is the information that the safest place for valuables is in the hotel safe, but that the paper containers can be used for hiding them under pillows, if desired, at the owner's risk. It is suggested that some articles of clothing be placed in the envelopes with valuables, so that the latter will not be left behind when a guest leaves a room. Blanks for filing complaints and for reporting articles found are available in each room, as is also a mending outfit, consisting of thread, needles, pins, buttons, and patches.

Placing Money, Jewelry, and Articles of Clothing in an Envelope Provided by an Ohio Hotel for Safeguarding the Valuables of Guests




## COAL MINERS' SAFETY LAMP USES BENZINE AS FUEL

Benzine, volatile product of coal-oil distillation, scarcely recommends itself as fuel for a safety lamp. Yet in Europe, inspired by the post-war shortage of petroleum, a coal-mine official has succeeded in designing a lamp which burns it without danger, and gives all the required signals of outside menace. Above the flame is a short conical coil of wire, between whose slightly open windings the air rushes in and insures complete combustion of the benzine vapor. The incandescent portion of the flame appears above this wire chimney, and when one-half inch high yields about two candle-power.

## MINE "TIMBERS" OF CONCRETE ARE CUSHIONED WITH SAND

Mine timbers have been successfully replaced with concrete pillars by a Belgian engineer, by making them hollow and filling them with sand. Tenons extending down from the concrete roof enter the pillars and rest on the sand cushion within. This allows a certain amount of settling, and the spiral form of the reinforcing in the pillars provides for a slight additional compression. If much downward movement is expected, the roof tenons are made long, and a hole near the bottom of the pillar allows the sand to be pressed out as the roof settles.

## BONE PENHOLDERS CARVED WITH IMPROVISED TOOLS

With a crude set of instruments consisting of a pocketknife, a file, a chisel made of a large needle, and a toothed piece of clock spring that serves as a saw, a prisoner in one of the penitentiaries carves elaborate white-bone penholders and disposes of them by mail. Like many of the trinkets made by inmates of our prisons during odd moments, they represent hours of difficult, tedious work.

To Raise Funds for Counsel, a Prisoner Spends Many Hours Carving Trinkets. Within Each of the Open Spaces in the Penholder, as Indicated, There Is a Tiny Ball That Rolls between Grooves

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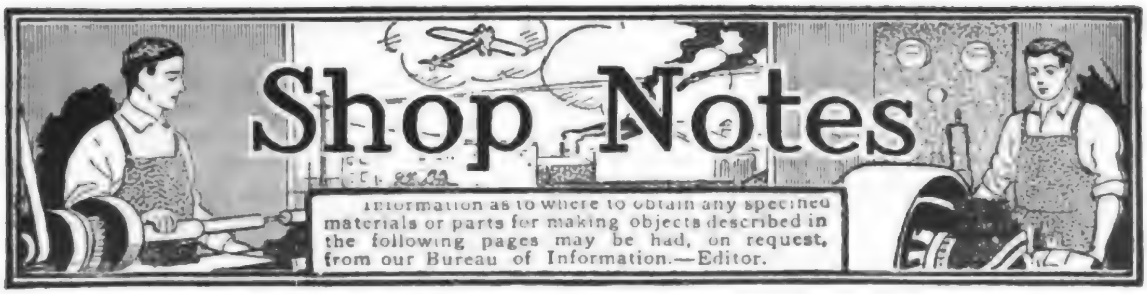


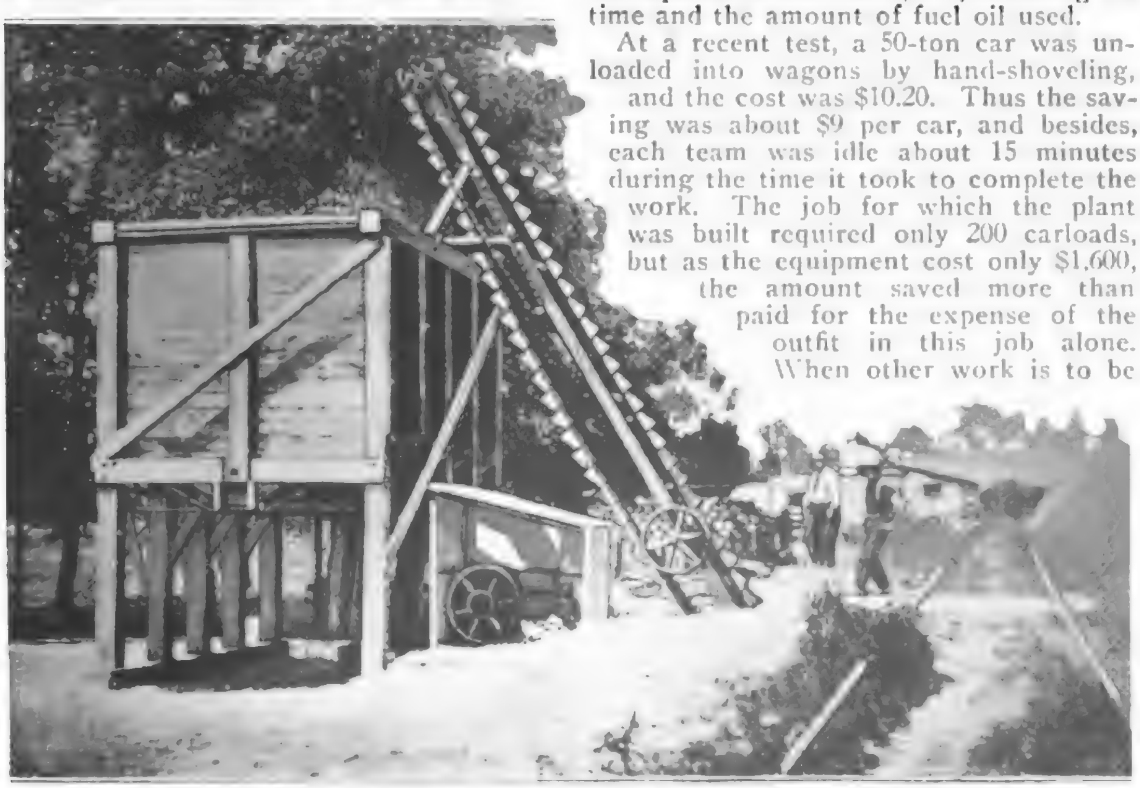

# Road Materials Unloaded at Low Cost

By JOHN ANSON FORD

THE great amount of road improvement now being undertaken in various parts of the country gives particular interest to a simple roadside outfit installed by a county engineer, which enables his workmen to unload crushed stone onto trucks or wagons at a cost of $1.25 for 50 tons. This is figured at recent costs for labor and material. As compared with the cost of handling this amount of material by hand-shoveling, or other methods usually employed in connection with road improvement, the method represents a great saving. More important, perhaps, than the saving in money, is the smaller number of workmen required, as scarcity of labor is now a troublesome obstacle to road work.

The equipment includes a storage bin of one-carload capacity, set high enough to permit a wagon or truck to be backed beneath it. Extending above the top of the bin from a pit dug beneath the switch track which runs alongside the bin, is a 30-ft. endless conveyor of a type commonly used in handling crushed stone. This conveyor is driven at small cost by a 9-hp. oil engine. The crushed stone is dropped, from the trap in the floor of the gondola or similar railroad car, into the pit, whence it is conveyed by the elevator to the bin, and then delivered by gravity to wagons as fast as they are drawn into position. An operator can unload a 50-ton car of stone in less than two hours at an expense of not over $1.25, counting his time and the amount of fuel oil used.

At a recent test, a 50-ton car was unloaded into wagons by hand-shoveling, and the cost was $10.20. Thus the saving was about $9 per car, and besides, each team was idle about 15 minutes during the time it took to complete the work. The job for which the plant was built required only 200 carloads, but as the equipment cost only $1,600, the amount saved more than paid for the expense of the outfit in this job alone. When other work is to be



**The Cost of Unloading Materials from Railway Cars for a Job of Road Building was Sufficiently Reduced by This Equipment to More Than Pay the Cost of the Whole Apparatus. The Latter could, Moreover, be Readily Moved to Another Location and Used Again**



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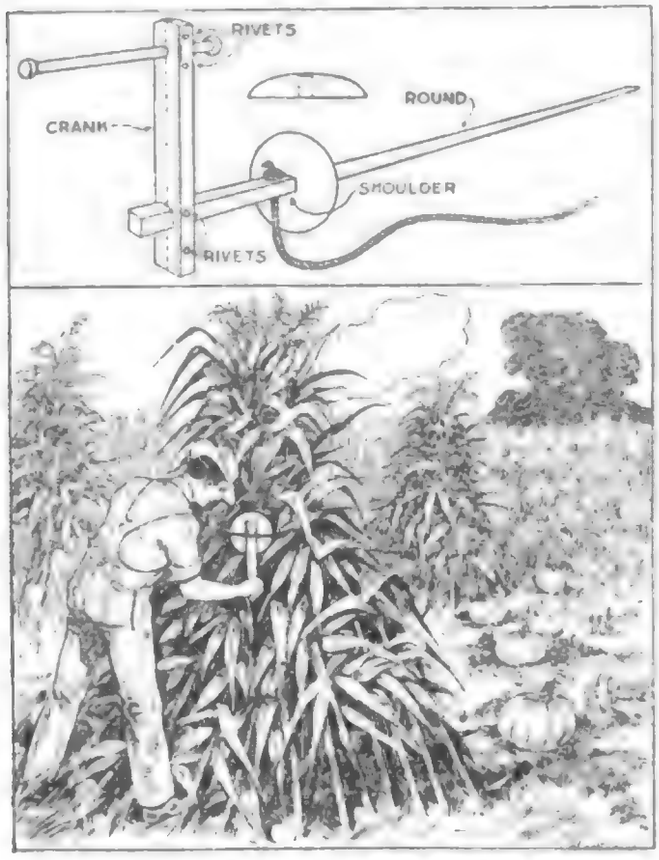
done, it can be moved, if need be, at relatively small expense.

The bin is held together by rods and bolts. No rails are used in the construction, which makes it easy to move the bin from one job to another. The estimated cost of moving it is $150.

## A Corn-Shock Binder

A device for tying fodder shocks, both green and dry, is made from a square oak




**A Quick-Action Device for Binding Corn Shocks, Both Green and Dry, will Save Considerable Time for the Busy Farmer**

stick, about 3 ft. long and 2 in. square. Beginning 10 in. from one end, turn this down to a diameter of 1½ in. at the square shoulder, and gradually bring it to a point at the end.

The disk should be 8 in. in diameter, and turned down to a saucer shape, with a hole, 1½ in. in diameter, in the center. About ½ in. from the shoulder, bore a ⅝-in. hole, and through this run a ½-in. rope, long enough to go around as large a shock as will be made. The rope should be knotted at each end, and one knot pulled up tight against the stick and held there by running a pin between the strands.

The crank is made from two pieces of hard wood, each 1 by 2 by 18 in. Put these in a vise and bore a 1¼-in. hole about 2 in. from one end, for the handle. In the other end make a 2-in. square hole, and run through it the end of the long piece, riveting it securely.

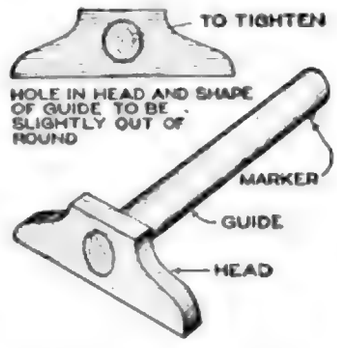
After a shock is set up, run the sharp end into it; put the rope around the shock; pull the loose end between the disk and the fast end of the rope, and turn the crank. The disk will slide down as the rope winds up; when the right tension is received, shove the handle into the shock and put on the band.—F. H. Sweet, Waynesboro, Va.

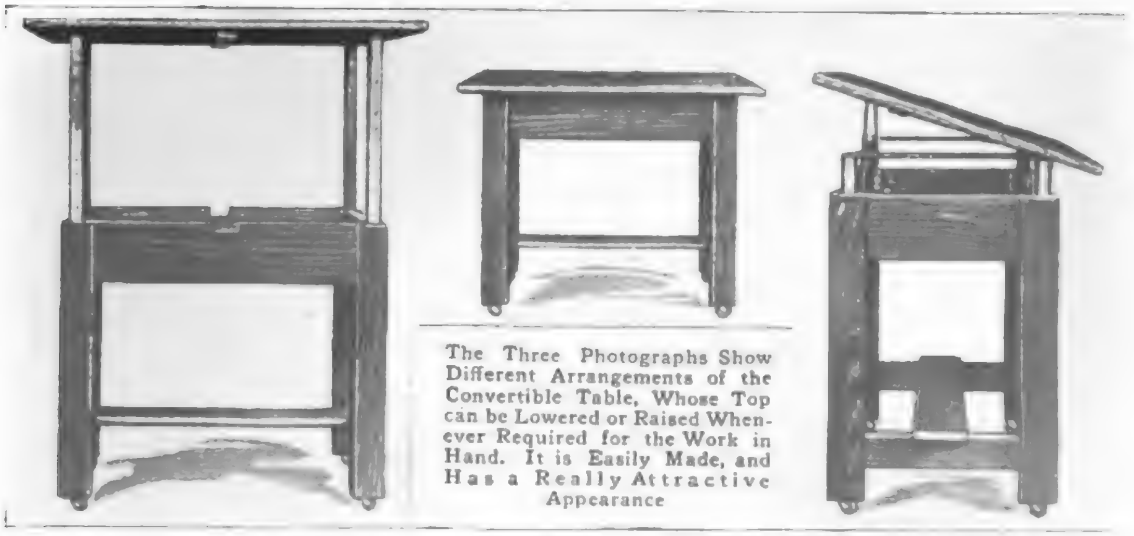
## Distributing Surveyors' Stakes Evenly

When distributing surveyors' stakes for work where only moderate accuracy is needed, it is common practice to drive along the line selected, and to drop the stakes at the proper intervals, or as nearly so as possible. It is difficult, however, to judge distances accurately from a moving wagon, and it is not unusual to drop too few or too many, so that they must be carried to their proper locations afterward. To meet this difficulty, procure a piece of cord of the same length as the desired interval, tie a folded newspaper, or some other white object, to one end, and attach the other to the rear of the wagon or truck. Throw out a stake, start ahead, and when the newspaper passes the stake that has just been dropped, throw out another one, repeating until all the stakes are distributed. This method has proved a timesaver in practical surveying, and a test has shown that stakes can be distributed over a distance of a mile in five minutes.

## Carpenter's Screwless Marking Gauge

The sketch shows a carpenter's gauge which can be set without using a setscrew. This feature is made possible by the shape of the guide and the hole in the head, which are both slightly oval in shape, and both of the same curvature, so that the head can travel up and down the guide. When the right position is reached, the guide is set by giving it a slight turn, while the head is held stationary. A turn in the opposite direction loosens it again.—Roy H. Poston, St. Francois, Mo.





The Three Photographs Show Different Arrangements of the Convertible Table, Whose Top can be Lowered or Raised Whenever Required for the Work in Hand. It is Easily Made, and Has a Really Attractive Appearance

## Convertible Table Has Three Different Uses

Finding my room space scarce, and needing for my purposes several kinds of tables, I built a table which is readily convertible for three different uses. As shown in the central photograph, it is quite like any ordinary library table. Its top is 26 in. by 30 in. in size, and is fitted with an imitation-leather cover and with brass corners. The legs are hollow, 3 in. square outside, and 1½ in. square inside. To the sides of the table a solid bottom is added, and this provides a cabinet for keeping writing or drawing materials.

To the right is shown the form which the table takes when it is to be used for drawing, or for any other work requiring a table of ordinary height with slanting top. For this purpose the inside mechanism is called into use. This consists of four inside legs, slightly less than 1½ in. square and 22 in. long; two hinges at the lower, or near, side of the table top, and two iron bars acting as adjustable braces at the upper, or rear, side. Each pair of legs is joined together by an iron crossbar. The inside legs are all drilled with holes to take steel pins, which, resting on the top of the outer legs, hold the table at any height desired.

To the left is a photograph of the table as raised to a height of about 48 in., this being a convenient height if the user wishes to stand when working. It will be seen that each leg has a number of holes for a steel pin, which can be placed through any hole, in order to give the desired elevation. When thus used, the two braces cannot, of course, be employed, but if it is desired to hold the table top at an angle, this can be done by thrusting a piece of broomstick under the table top, between it and the crossbars.—H. B. Graeff, Los Angeles, Calif.

### Movable Partition on Truck

A delivery boy who used a light motor truck on his trips, occasionally had trouble with boxes and crates containing fragile articles, such as eggs, ice, etc. With a full load he had no difficulty, as the boxes had no room to shake loose, but as the load became smaller, they were jolted back and forth about the floor of the truck. He prevented this by reducing the space occupied by the freight, so that it would always be packed tightly, the device used being a sort of auxiliary tailboard, which could be moved forward toward the front of the truck as the load diminished in size, while the floor at the rear was left empty. Rows of holes, three to a row, were bored in the floor across the truck at intervals of one foot, and metal plugs which projected from the lower edge of the tailboard fitted into the holes, so that the board was held in a vertical position wherever needed. For the plugs, short rods were used, flattened at one end to form flanges, so that they could be fastened by screws to the tailboard.—Jack Solon, Natchez, Miss.

¶ Dirt and grease are quickly removed from a carborundum wheel by holding a coarse piece of sandpaper against it, and turning the wheel at a fairly high speed.

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## Bicycle Racks for the Shop

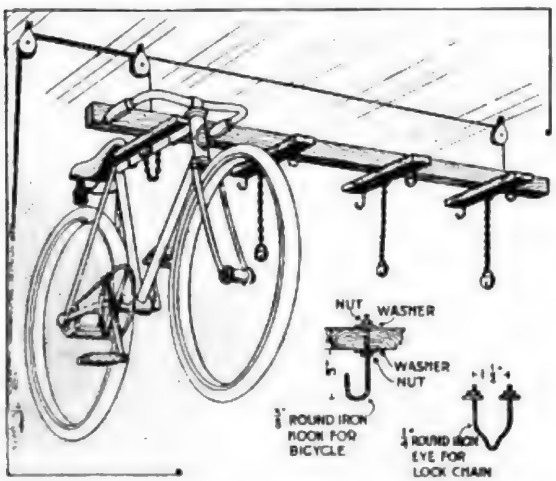
Many shop employes ride to work on their bicycles every nice day. It is good policy on the part of the employers to furnish a place in which the bicycles may be protected from weather and theft. Two methods are shown in the illustrations.

The photograph shows bicycle racks made of pipe inserted along the wall of

Bicycle Racks Made of Pipe, Inserted into the Wall of an Unused Basement, Provide Places for Employes' Machines

an unused basement. This type of rack could be used any place where the wall space is available. Each unit is made of ⅜-in. pipe, is 30 in. high, and is placed 4½ in. from the wall.

For places where room is at a premium, the type of rack shown in the drawing can be used, provided there is enough overhead space. If there is a driveway




In Crowded Places, a Rack Which can be Pulled Up to the Ceiling Takes the Place of the Ordinary Bicycle Stand

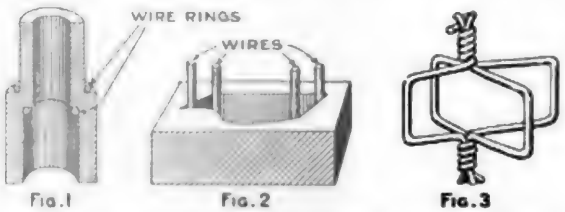
or high-walled room which can be used, it will prove a great convenience and will not be in the way, except during the time when the workmen are arriving or leaving. At other times the frame, with the bicycles slung from it, is pulled up out of the way, clearing the space for other uses.

If any workman desires to leave between regular hours, he must either climb up a ladder to release his machine, or else choose a time when the frame can be lowered without stopping work.

The frame, of 2 by 4-in. lumber, is slung from pulleys on the ceiling. Short pieces of boards provided with hooks hold the bicycles, with chains to lock the machines securely in place. The hooks and U-bolts which hold the chains are made from ⅜-in. iron rod, bent into shape and threaded. The hooks are then padded by wrapping them with electricians' tape, so as not to injure the bicycle enamel. Each workman is assigned a place on the rack for his machine, and provides his own padlock with which he secures his wheel.

## Hardening Pieces with Sharp Corners

In hardening pieces with sharp corners, cracks are likely to result at these points. A very satisfactory method of overcoming this is to place wires in the corners, as




When the Piece to be Hardened Has Sharp Corners, Cracking may be Avoided by the Use of Wire

shown. The wires then get hot at the same time as the piece, and in quenching they keep the corner hot a little longer, thereby keeping it soft for a short time while the sides are cooling, and allowing it to accommodate itself to the surface strains set up. These corners, however, seem to become as hard as the rest of the piece, so no hesitancy need be felt on that score.

In the piece shown in Fig. 1, two wire rings are simply placed in the corners. In Fig. 2, a wire form must be placed inside. This may be accomplished by bending the ends of the wires that go in the corners toward the center and twisting them together on both the bottom and top, as shown in Fig. 3.—S. B. Royal, Philadelphia, Pa.

¶To cement leather and brass, place a piece of mending tissue between them, and apply a hot flatiron to the leather. The tissue melts, and the two are firmly cemented.

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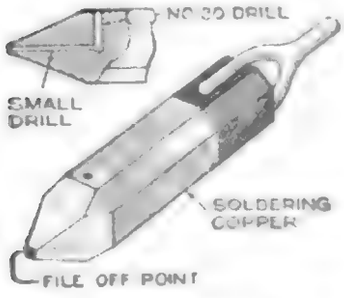
### Piano Keys Repaired with Celluloid

When the ivory tops of piano keys are missing, a good substitute can be made at little expense. Procure a small piece of transparent celluloid, of the kind used for automobile curtains, and cut it to shape. Then mix a small amount of glue with white zinc, so that it acquires the color and consistency of thick cream. Cut a piece of white paper a little larger than the celluloid, and glue the two together; then glue the paper, with the celluloid above it, to the piano key, and place a small weight upon it, to hold it until it is dry. The loose edges of the paper can then be trimmed off, and the celluloid over the white glue and paper will have about the same gloss and color as ivory. —Jack Solon, Vicksburg, Miss.

### A Fountain-Pen Soldering Copper

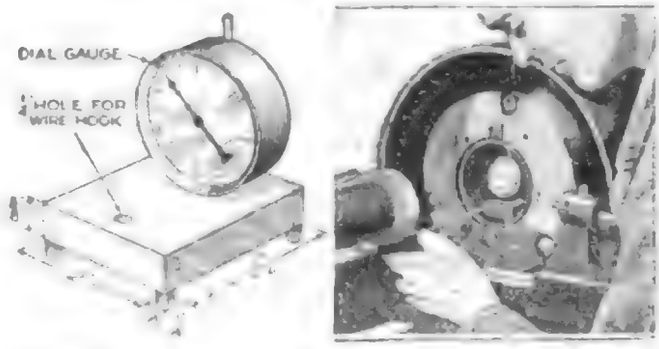
For soldering small work, it will be found convenient to use a soldering copper with two holes drilled in it as illustrated, so that the solder, in wire form, can be held against the opening of the larger hole at the side of the copper, there melting and flowing through the perforation to the point. To make this kind of a soldering copper, first file off the point to produce a flat just large enough for a No. 55 or 60 drill, and drill a hole from the point through the tapered part of the copper. From a spot on one of the parallel faces of the copper, drill a larger hole (about No. 30 or ⅛-in.) to meet the smaller one near its inner end. If the smaller drill is not long enough to reach the point indicated, there is no objection to slanting the larger hole sufficiently to intersect the smaller one.




This type of soldering copper has been found particularly useful for filling holes with solder, as it delivers the solder directly in the hole, whereas with the ordinary copper it is necessary to build up from the side, and the job may not be successful on account of the solder being too thin and opening up. The reason why the center hole must be so small is that the solder will not then run out of it until the copper is touched to the work. Its action is very similar to that of a fountain pen.

### Gauging Diameter of Cylinders

The illustration shows a recent method of testing the diameter of a cylinder after grinding. The practice of using a solid plug gauge has been found unsatisfactory in some cases, as that type of gauge is likely to get jammed in the cylinder, and attempts to remove it sometimes have the effect of throwing the cylinder out of line, so that it is necessary to reset it and grind it again. The dial gauge here shown has a small plunger at the top, and the distance to which it is depressed depends on the diameter of the cylinder, which is thus ascertained by reading the dial. The plunger and the legs of the stand are of hardened steel, so that very accurate readings can be obtained. The gauge is thrust along the interior of the cylinder and drawn out again by means of a wire hook, which catches in a small hole in front of the dial. Before using it to measure cylinders of any given model, the gauge must be tested on a ring gauge, ground with great accuracy to the inside diameter desired for the cylinder. A reading of the dial will then show the position which the pointer must indicate when the cylinder has the required diameter.—J. J. McIntyre, Bridgeport, Conn.




A Dial Gauge, Equipped with a Light Spring Plunger, Measures the Interior of a Cylinder without Danger of Getting Jammed

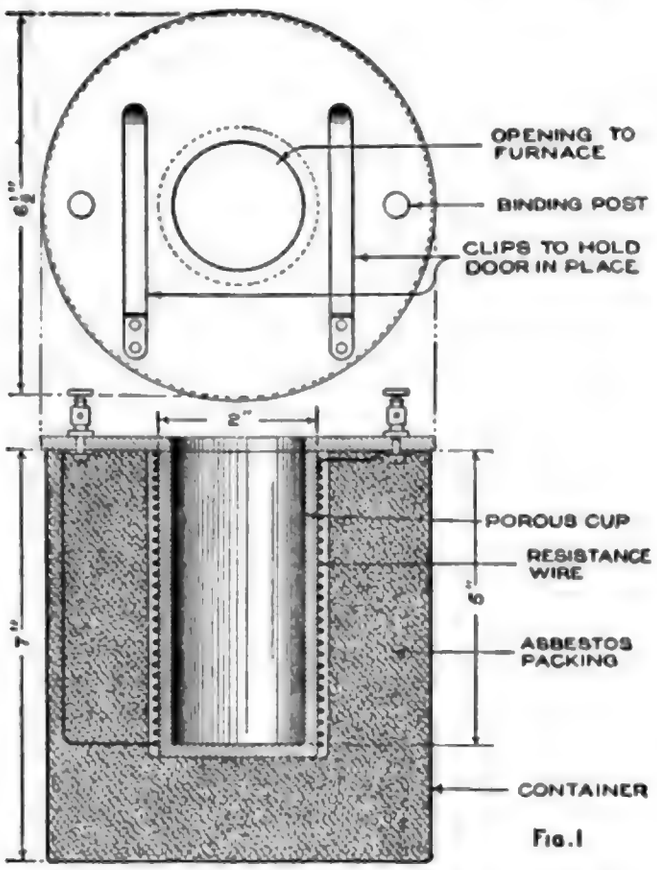
### To Keep Paintbrushes Soft

On many painting jobs it is necessary to leave the work for a while, returning to it again to use the same color and brush as before. In such cases it is waste of time to clean the brush. Take it out of the pot, lay it on a piece of waxed paper, wrap it up, and wind the end of the paper securely around the brush handle, twisting it tightly at both ends. This will prevent the air from reaching the brush part, which will be perfectly supple when needed, no matter how long a period has passed since it was wrapped up.

# Simple Electric Furnaces Using Resistance Wire

By THOMAS W. BENSON

WHERE temperatures up to 1,100° C. are required in the laboratory, for ignition or other purposes, nothing is




**The Smaller Furnace can be Built in a Tin Can, with Pipe Covering as a Heat Insulator**

superior to a furnace of the resistance-wire type. They are not only preferable on account of their cleanliness and ease of operation, but cheaper to operate than a gas furnace of the same rating.

The two furnaces described cover the usual range of requirements for the experimenter and chemist, and are cheap to construct. The maximum temperature of 1,100° C. (2,012° F.) will be reached when the furnace is connected directly to a 110-volt current and its opening covered. Lower temperatures may be maintained by the use of a lamp bank.

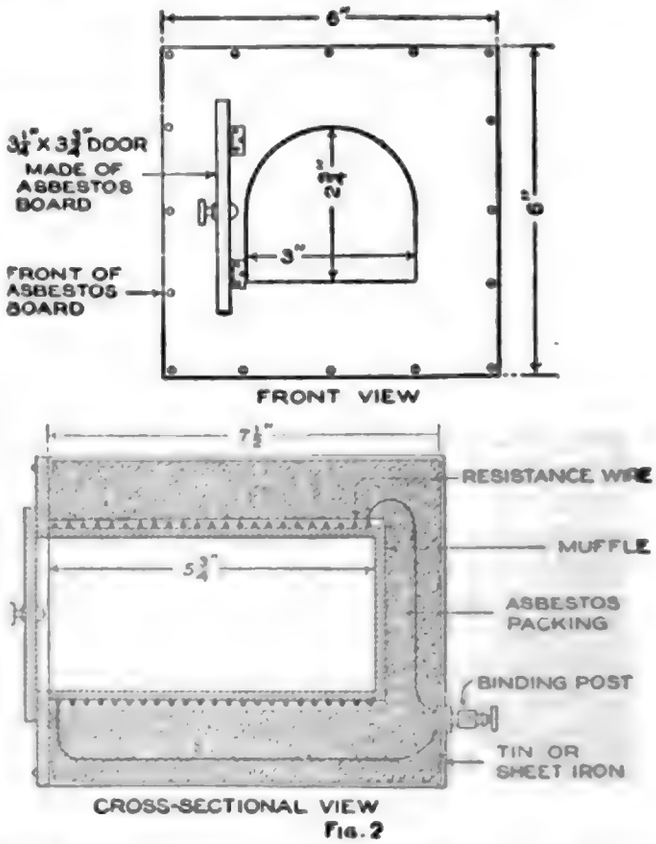
In Fig. 1 is given the various details of the construction employed. The foundation for the furnace consists of a porous cup, such as used in two-fluid batteries. This cup measures 2 in. in diameter and is 5 in. deep. The heating element is wound directly onto this cup, and consists of 32 ft. of No. 20 gauge nichrome wire.

In winding the cup, one end of the resistance wire is held in place with a few turns of iron wire. The winding should be made evenly, but at the open end of the cup the turns should be closer together, due to the greater radiation of the heat. Sufficient wire should be left free at each end to make connection to the binding posts.

The winding must then be coated with a refractory material, to insulate it and protect it from air and acid fumes. The best mixture to use for this purpose consists of one part of kaolin to three parts of ground quartz. The kaolin and ground quartz are mixed up with water into a paste, and plastered evenly over the winding, taking care to fill all spaces between the wires. The coating can then be baked by passing a current through the winding, sufficient to heat it to a medium temperature. When dry, repair any cracks in the coating with paste, and paint the whole with dilute water glass.

The furnace chamber is now to be mounted in a heat-retaining chamber. The container may be of tin or asbestos board, as preferred, the packing being asbestos. A good method of constructing this heat-retaining chamber is to obtain a short length of 2-in. pipe covering, and fit a tin can around it.

The top of the furnace should be made




**The Larger Furnace will Require a Little More Work in Building but will Accommodate Somewhat Larger Objects**

from asbestos board, ¼ in. thick. This is drilled, for the binding posts and the

screws holding the clips, as shown in the illustration. A hole is also cut the same diameter as the interior of the furnace chamber.

Connections for the furnace are given in Fig. 3. A lamp bank is used, with sufficient lamps to pass three amperes. Six 16-cp. carbon lamps will be right for the purpose. The lamps and a switch are mounted on a board fastened to the wall for convenience, flexible leads running to the terminals on the furnace.

The furnace is used in the upright position when melting metals or alloys, but for heating solids it may, when desired, be laid on its side, a strip of thin asbestos board being slipped in to form a flat bottom. By means of the clips on the top of the furnace, a piece of mica may be held in place to form a door, and thus keep the temperature constant while allowing the reactions in the furnace to be observed.

The larger muffle furnace is shown in Fig. 2. The method of construction is the same, the difference lying in the higher current consumption necessary to heat the muffle. The winding consists of 65 ft. of No. 17 gauge nichrome, on a muffle 3 in. wide, 2¾ in. high, and 5¾ in. long. The muffle can be purchased for about $1 at a chemical-supply house.

The container for this furnace is square, being made of heavy tin or sheet iron. The front, however, is of asbestos board, in which is cut a hole the same size as the muffle opening. The door is made from asbestos board, and swung on two small hinges. The binding posts are mounted on the back, and are thus out of the way. The heating element is prepared like that for the smaller furnace.

The lamp bank used with the larger furnace should pass five amperes, either ten 16-cp. or five 32-cp. carbon lamps being used, as desired. For closer regulation of the furnaces, water rheostats may be employed capable of passing the current required by the furnace.

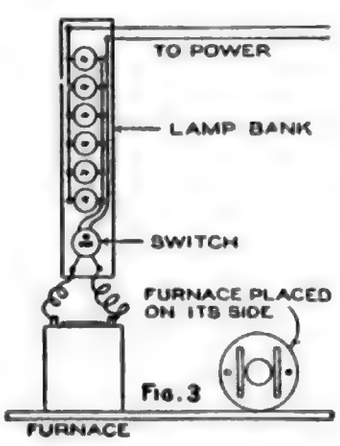


Fig. 3

The temperature of the furnaces can be determined by mounting a chemical thermometer in them, or by calibrating the furnace in such a manner that the temperature is indicated by the amount of current flowing in the circuit.

The cost of building any of these furnaces should not be over two or three dollars for the cup, or muffle, ground quartz, kaolin, wire, and asbestos board. Most of the other material can usually be obtained around the shop or laboratory.

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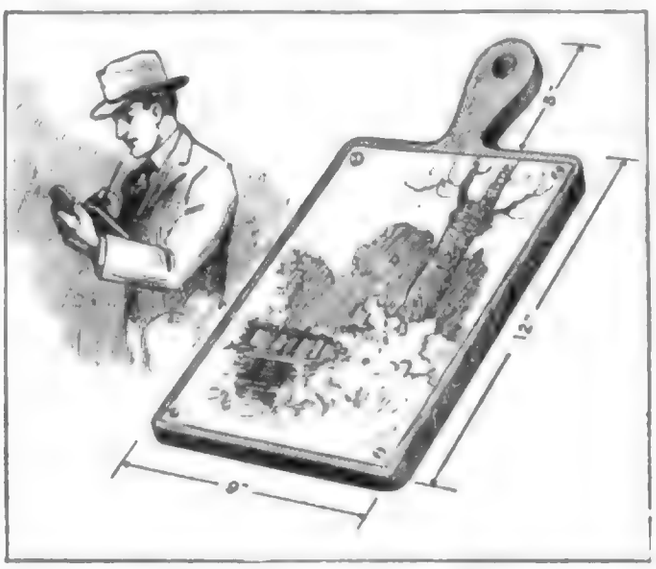
### A Handy Sketch Pad

A convenient form of sketching board, suitable for field work, can be made as


A Projecting Handle Makes a Small Drawing Board Easy to Hold, or to Carry When Not in Use

indicated in the illustration. It is held steady against the body by grasping the projecting handle, through which a hole is bored so that the board may be hung up when not in use. If made of wood soft enough to admit thumb tacks, a day's supply of paper can be fastened to the surface, to be used as required.—C. Nye, Bronx, N. Y.

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### Funnel Made from Oilcan

A garage mechanic frequently found difficulty in filling automobile vacuum tanks, owing to the small size of the opening at the top. The work required a funnel, but he had none small enough to do the filling neatly and without spilling. He therefore made one out of an ordinary oilcan. He removed the bottom, and cut about 1 in. off the spout, so as to make it sufficiently wide to insure a reasonable speed of flow, without being so wide as not to fit the openings in the tanks. The funnel was made in a few minutes, and proved far more durable than many of the larger ones used in the shop.

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### Signs Painted with Plant Sprayer

The drawing shows the method used by a merchant to make sales signs cheaply and efficiently. After determining the size and wording of the signs, he cut

A Sprayer, of the Type Used to Rid Plants of Insects, is Put to Good Use in Making Store Signs

stencils for the various letters from ordinary wrapping paper, or old newspapers. These stencils are placed against the surface which is to receive the sign, and held by thumb tacks.

A sprayer, of the type used to apply insecticides in liquid form to plants, is filled with ordinary show-card color. At various times the merchant has tried common ink, carefully mixed water color, and a solution of dye in water. The latter is not practical unless a small amount of gum arabic is used in the solution. The sprayer is used to distribute the color evenly in the perforations of the stencil. If desired to make a deeper color, it is only necessary to spray the surface a second or third time, first allowing the preceding coat to dry.

By using commercial stencils, which can be bought cheaply, an accurate, pleasing sign can be made quickly, cheaply, and without much trouble.—J. Horace VanNice, Waukon, Ia.

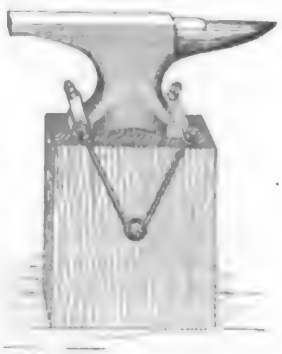
### Sawdust Smothers Oil Fires

A bucket of water will only scatter a fire from burning oil or waste, making it more difficult to control. Instead of using water, keep in the garage, or wherever such fires are likely to start, a bucketful of clean sawdust with which has been mixed a pound or two of common soda. The sawdust will effectually smother a small blaze, and if the fire is very hot, the soda will give off a gas which aids in smothering the flames. Care must be taken to see that the sawdust is not oil-soaked.

### Keeping Small Tools Rustless

Anyone who has a collection of small tools, such as taps, drills, etc., will find it a good plan to line the tool drawers with corrugated paper, so that each tool will keep its proper place, and be easily identified. If the atmosphere in the neighborhood of the drawer contains considerable moisture, as is likely in districts along the coast, it is advisable to saturate the corrugated paper with oil, so that it may creep around the small tools, and preserve them. As the numbers stamped on taps are usually too small to be easily read, it is good policy to glue a strip of white paper to the corrugated board at the position occupied by each tap, with the number, size, and number of threads per inch clearly marked.

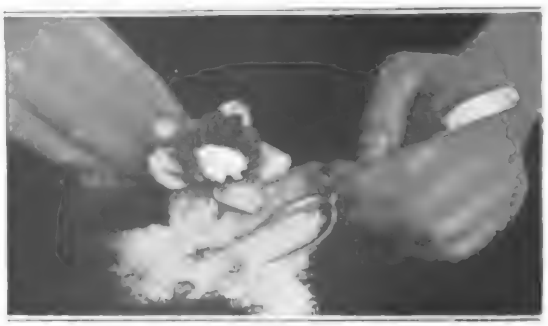
### Fastening a Heavy Anvil



To fasten an anvil securely, pass a rod horizontally through the block, so that each end of it will hold a V-shaped tie-rod, which is fastened to metal straps passing along the base of the anvil on each side.

### Flowers Preserved by Sand Filling

Most flowers can be preserved by filling the parts with clean sand, and in this way they can be made to retain their natural color and shape. A bloom treated in this way should be buried in a box filled with sand, and left for about ten



Flowers Filled with Sand, and Afterward Dried in a Box, will Retain Their Color Indefinitely

days. After this period it will be completely dry, and will keep indefinitely.—S. Leonard Bastin, Bournemouth, Eng.

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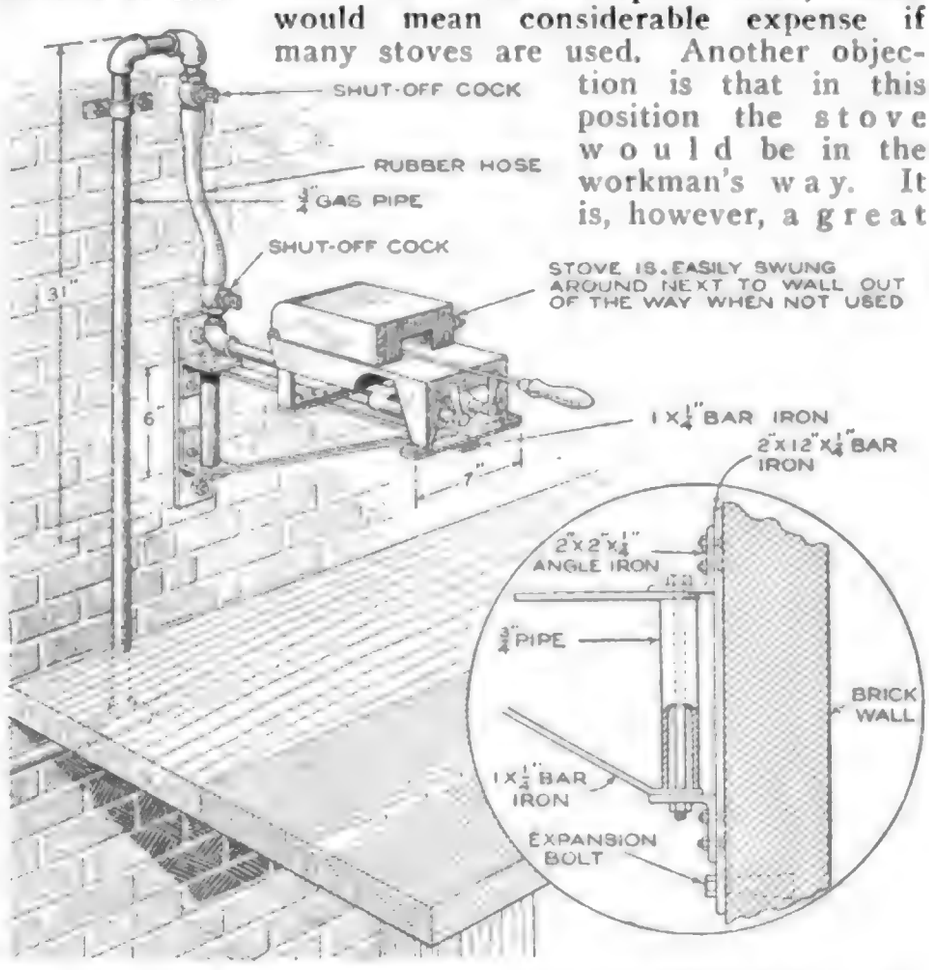
### Carbon Bisulphide for Destroying Field Rodents

The woodchuck, one of the most destructive rodents, can be destroyed by applying carbon bisulphide to the burrow. This liquid, which can be purchased at most drug stores, evaporates quickly and forms a poisonous gas. To get the best results, close all but one or two of the burrow entrances, leaving those open which are at the highest elevation, and apply the liquid through these. In this way the gas, which is heavier than air, and therefore sinks to the lowest level, will penetrate to every part of the burrow. Attach a loose wad of cotton waste or rags to a pliant stick, and saturate it with half a teacupful of the liquid. Insert the stick into the opening, and run it as far down as possible, after which the entrance must be plugged up. The gas generated will in most cases kill the pest, but in porous soil he occasionally escapes by retreating to one of the higher passages, where he digs into fresh earth. To make sure of destroying him, open the burrow about 10 minutes after the liquid is applied, and explode the gas with a piece of burning refuse at the end of a stick. When doing this, be careful to stand well to one side of the hole, so as to avoid being burned by the flame of the exploding gas.—Alvah H. Pulver, Sodus, New York.

### Soldering-Iron Heater Mounted on Swinging Support

In shops where gas stoves are used for heating soldering irons, melting babbitt, or for any other purpose, there are various disadvantages in keeping a stove on a bench. It is likely to be upset, and fire-insurance inspectors would in many cases insist on a fireproof base, which would mean considerable expense if many stoves are used. Another objection is that in this position the stove would be in the workman's way. It is, however, a great advantage to have the stove within easy reach, instead of having to make a special trip whenever heating is to be done, and the arrangement shown in the illustration has been tried with good results.




A Pivoted Bracket, Attached to a Wall, Supports a Soldering Stove without Wasting Bench Space. The Cheapness with Which the Equipment can be Installed Is Another Valuable Feature

The stove rests on a swinging bracket, about 15 in. above the bench, and can be turned either to the right or to the left, so that one workman can stand on each side of it, and every stove thus will do double duty. When the stoves are not needed, they can be swung back against the wall, so that they will not be in the way, and no bench space will be wasted. Where electricians, armature winders, or tinsmiths are employed, work can be done far more handily by this method than under the usual conditions, and by allotting separate stoves to each pair of work-

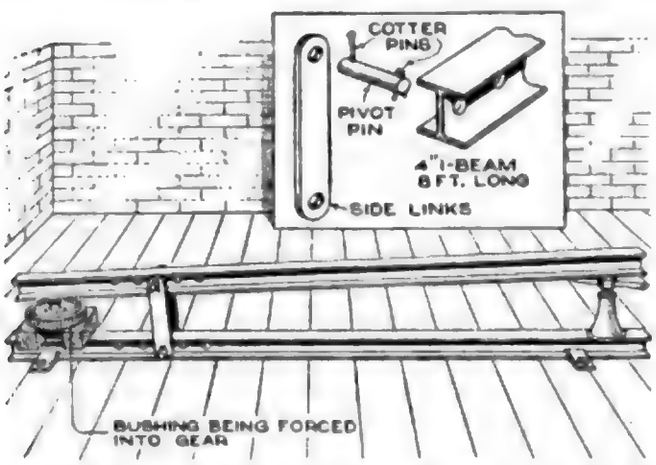
### Forgeman's Stationary Scale

A set of graduations stamped along the side of an anvil will sometimes prove as great a help to a blacksmith as an extra pair of hands. As a rule, he needs one hand to hold his work and the other to use the hammer, so that handling a scale is a matter of considerable difficulty. If it is not convenient to stamp the graduations, an ordinary metal scale can be attached to the anvil.

men it is possible to eliminate much of the confusion which is responsible for serious waste of time. The selection of the materials needed for installation will depend to some extent on conditions in each shop, but the arrangement shown in the detail on the right of the illustration will be a fairly dependable guide. A slightly different adjustment is shown in the perspective, but here the construction is not quite so strong, as the horizontal members of the angles which support the pivot are turned toward each other; if turned as shown in the detail, they give greater security. The cost of the materials should be about $1.75, not counting the price of the stove.—Arthur F. Cox, Chicago, Ill.

### A Cheap Heavy-Duty Press

A substantial press for heavy work, as straightening shafts, axles, forcing in



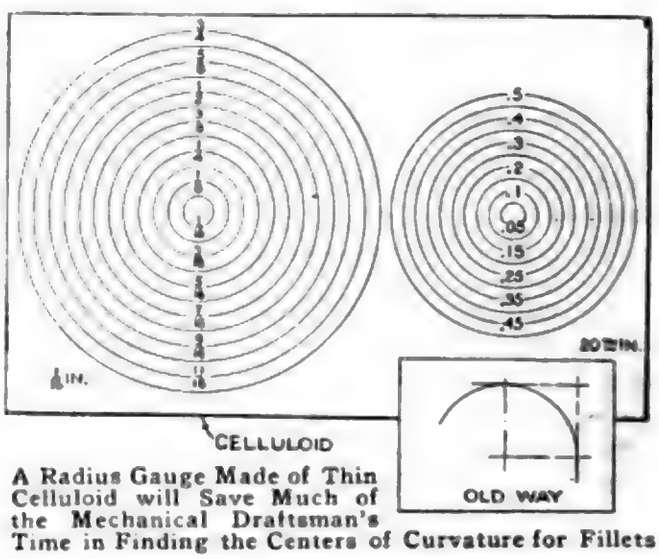

A Screw Jack and Some Scraps of Steel will Form a Very Powerful Press, Useful for Many Purposes around the Small Shop

bushings, and punching holes through steel plates, can be made from 8-ft. sections of 4-in. I-beams and a jack. One beam is placed on the shop floor, and anchored with clamps and lag screws, if desired. The other section is mounted, 18 in. or more, as desired, above the first, and a fulcrum made by drilling 1-in. holes through each beam, passing two pivot pins of similar size through two opposite holes, and extending them through the side links as shown. The purpose of drilling a row of holes is to provide means of changing the location of the fulcrum, with consideration to the pressure required and the distance through which this pressure must act. The fulcrum, when placed farthest from the jack, gives the greatest pressure, but the movement is correspondingly limited. Suitable blocks to support the part being worked on, and to make up for varying widths, are to be used in conjunction with the press in a small shop.

### Locating Centers of Curvature

A job which the mechanical draftsman has to do a great many times is to determine the center of curvature for a small fillet. It does not require a great deal of time to do this with the bow pencil, but where it must be repeatedly done, the amount of time consumed is considerable. Where this is the case, draftsmen may find the gauge illustrated to be a great convenience. It consists merely of a number of concentric circles spaced by steps of 1/16 in., 1/20 in., or any convenient distance. At the center of the circles is a small hole just big enough to take the pencil point. When a fillet is to be drawn, the proper circle is selected, and placed over the corner so that it is tangent to both sides of the angle. The pencil point is then placed through the gauge and a mark is thus made for the center of the fillet curve. It will not be necessary, ordinarily, to place the bow pencil in position and draw the fillet in, as it can be easily sketched in with the pencil. When the drawing is inked in or traced, the fillet can be drawn accurately with the bow pen, using the center determined.

Another method of marking the gauge will be useful where there are one or more standard lengths for the radius of fillets. The circles can then be drawn, each representing the correct curvature for a certain scale. The circle to be used will then be decided with reference to



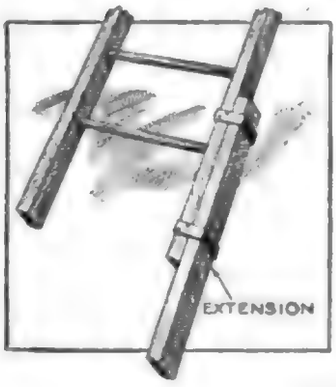

A Radius Gauge Made of Thin Celluloid will Save Much of the Mechanical Draftsman's Time in Finding the Centers of Curvature for Fillets

the particular scale to which the drawing is made.—Ben Frantzreb, Indianapolis, Indiana.

### Hammer Handle Kept from Slipping

Mechanics sometimes find that they can get a better grip on a hammer if they make a few notches on the handle where it is grasped by the fingers. In order to place the notches correctly, rub a little chalk on the inside of the fingers, and grasp the handle in the natural way. The chalk will show the right locations, and the wood can be chiseled or filed out at these points.—C. C. Spreen, Detroit, Michigan.

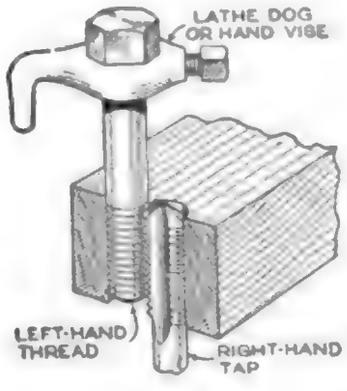
### Ladder Has One Adjustable Side




A ladder with an extension on one side is very handy on a farm or for the repairman wherever the ground is uneven. It is also useful when work is being done on a staircase wall.

### Right-Hand Tap of Same Pitch Cuts Left-Hand Thread

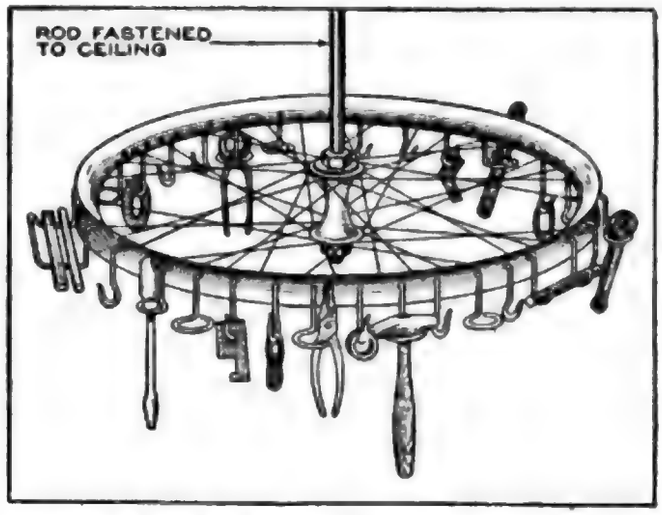
When a left-hand thread is required on a bolt and no left-hand die is available, it is possible to cut the thread by the use of a right-hand tap of the same pitch, though not necessarily of the same diameter. To do this, bore two holes in a piece of hard wood in such a way that they will cut into each other, the sizes of the holes being equal, respectively, to those of the bolt and tap. The tap is screwed into one hole and held rigid; the other hole serves as a guide for the rod to be threaded. It is screwed into the hole just as it would be screwed into a left-hand die; as the metal comes against the cutting edge of the tap, a left-hand thread on the bolt results.—J. H. Moore, Toronto, Can.




¶The skin of the human palm has been found to be a very delicate and effective strop for razor edges.

### Tool Rack from Bicycle Wheel

A machinist who used a large number of small tools in his work found that he




**A Bicycle Wheel Supports a Workman's Tools above His Head, and Enables Him to Reach Any Tool Desired by Giving the Wheel a Turn**

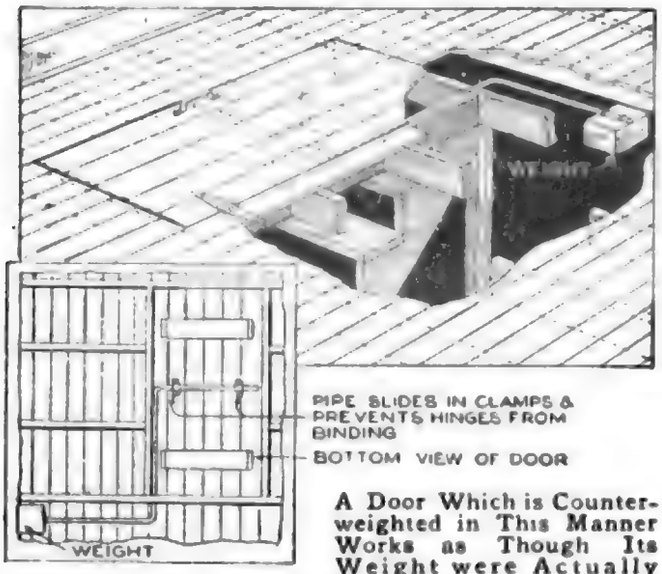
lost considerable time in trips between the tool lockers and the bench. It was not practical to fit a tool rack, or shelf, to the wall above the bench, since the tools were so numerous that it would have been impossible for the workman to reach all of them without letting go his work. Accordingly, he made a revolving rack out of the front wheel of an old bicycle. He removed the tire and axle, and ran a long 5/16-in. rod through the bearings, fastening it loosely with bolts on both sides of the wheel, so that the latter would revolve easily. The top of the rod was secured to the ceiling, and the wheel hung at rather more than the height of a man above the floor. A number of 1/16-in. holes were punched all around the rim, and short pieces of wire were fastened in them, with the free ends bent into hooks, to support the tools. In this way, a workman could reach any of the tools with one hand, while holding his work with the other. It was merely necessary to give the wheel a spin, and any tool desired came within easy reach.

### Removing Putty from Glass

When putty has hardened with age, it is a rather delicate operation to remove it from a window pane. Old putty can, however, be removed from glass if nitric or hydrochloric acid is used to soften it. Paint it well with the chemical, using a small brush, and let it stand for an hour. At the end of that time it will be thoroughly softened, and can be wiped off without difficulty.

### Counterbalanced Floor Door

The illustration shows a method used to reduce the labor of opening a floor door leading to a cellar stairway. A piece

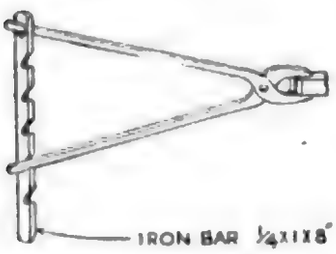



**A Door Which is Counterweighted in This Manner Works as Though Its Weight were Actually Decreased, the Door Being Easy to Close as Well as to Open**

of 1-in. pipe was bent to the shape indicated, and the door was fastened to one end of it by sheet-iron clamps. At the other end was fastened a weight, almost equal to the weight of the door. The effective weight of the door is thus reduced to a very small fraction of its true weight, and it is easily opened by a child. The great advantage of such a counterweight over the methods of using a spring, or a weight hung from a cord, is that the counterbalancing force is nearly equal to that of the door in any position.

### Lock for Blacksmiths' Tongs

The lock or catch illustrated was made by a country blacksmith, from a piece of ¼ by 1 by 8-in. iron. It increases the capacity of each pair of tongs, as the handles can be held tightly, even when opened far beyond the grasping ability of the smith's hand. Also, as the work is held by the lock on the handles, the whole can be turned or laid down without any danger of dropping the hot iron. A slight depression should be made in the upper handle to fit the edge of the round hole in the lock. In use, the handles are sprung sufficiently to let the bar enter this depression.—James E. Noble, Portsmouth, Ontario.

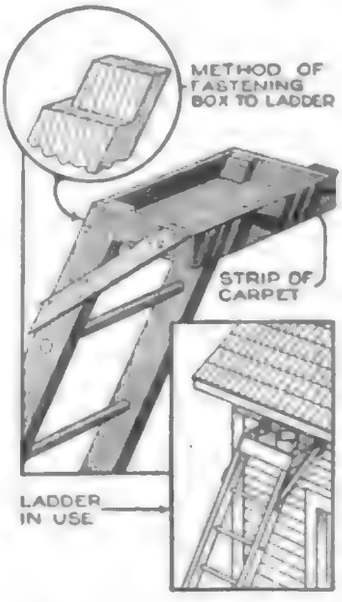



### Resurfacing an Old Wooden Bridge

In a western state the floors of wooden bridges are given a waterproof surface, which not only protects the wood, but makes a smooth, durable roadway. The cracks between the floor boards are first filled with wooden strips. A layer of sand and gravel is then placed on the boards, and is covered with a heavy coat of clay. This is saturated with a good grade of road oil, and the surface is soon packed to a hard, smooth finish by the traffic over the bridge. A bridge that has been treated in this way will not give a bumpy ride to cars passing over it, and the life of the timbers will be considerably increased.—W. L. Prouty, Denver, Colorado.

### Ladder Head for Painting

The amateur house painter occasionally gets into difficulty when working close under the eaves trough at the top of a house wall. Unless the ladder is long enough to rest against the gutter, he has hardly room enough to paint that part of the wall against which the ladder rests, and when he works on the gutter itself, he is in an insecure position, as his foothold on the ladder is too close to the wall for him to balance properly. The difficulty can be met by furnishing the ladder with a small platform at the top, which will maintain a short distance between wall and ladder, and if it is made in the form of a box, it will hold paint pots and brushes. The box is very easily put on or removed. It may be made of ordinary ⅞-in. lumber, and should extend about 10 in. from the top of the ladder, but no more; a greater distance would make it difficult for a workman to reach the wall when standing on the lower rungs. If the sides of the box are about 4 in. high, they will give sufficient strength to the construction, and will provide the necessary security for brushes and pots, while working in insecure positions.



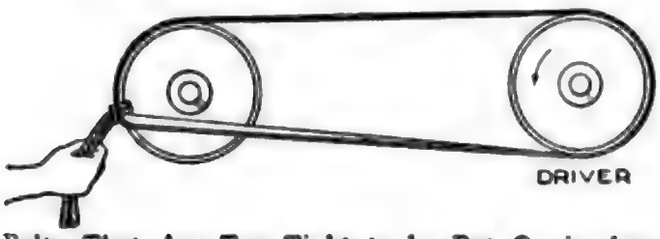
### Grease Gun for Applying Cement

An automobile grease gun was used in amateur building operations by the owner of a house which began to show signs of wear. An ornamental facing block, that had fallen from the base of a stone column, was fastened in its former position with cement. Before the cement was applied, a few large nails were thrust between the block and those above and below it, so as to keep them separate, after which the cement was forced into the spaces with the grease gun. When it had dried, the block was firmly fixed.

### Putting on a Tight Belt

At times a belt is so tight that it is almost impossible to put it on the pulley with the power turned on or off. By using a rope, as shown in the sketch, the belt may be handled easily.

The belt is placed on the drive pulley, then on the other pulley as far as possible. A loop of the rope is passed over the rim of the pulley and around the belt, the free ends of the rope being passed through the loop. This is really a slipknot around the belt and pulley. When




**Belts That Are Too Tight to be Put On in Any Other Way may be Handled Easily by Using a Rope**

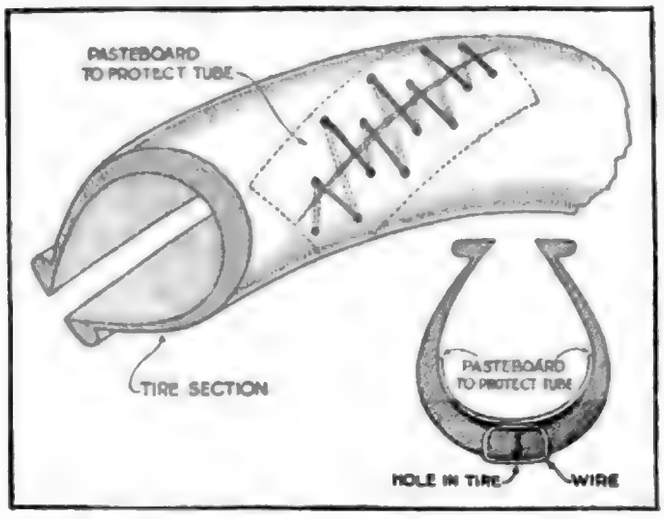
the power is turned on, the rope holds the belt to the pulley until it slips into place. As the belt leaves the pulley on the other side, the rope is pulled out of the hand, and, as the increasing distance opens the slipknot, the rope falls to the floor. If the belt is heavy or the rope rough, it is advisable to wear a glove while putting on the belt, and care should be exercised in turning on the power. This method has been used very successfully, and is a great timesaver.—S. B. Royal, Baltimore, Md.

### Typewriter Oiled with Pen

When a typewriter is being lubricated, too much oil does as much harm as too little. The quantity can be controlled by using a clean pen, which is dipped in the oil, and pressed lightly on the surface where lubrication is needed.

### Tire Blow-Out Repaired with Wire

An effective, if somewhat crude, temporary repair for a blown-out tire casing is made by simply lacing with soft-iron wire in the manner shown. A series of

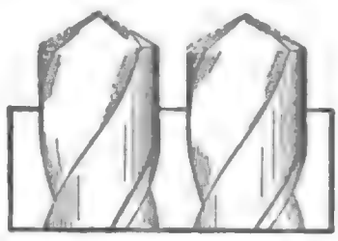



**While Repairing a Tire Casing with Wire is Not to be Recommended as a Regular Practice, It can be Done in This Fashion When No Other Means of Repair Is at Hand**

staggered holes are made in the fabric on either side of the hole, and the wire is threaded in and out in a manner similar to the lacing of belts. A piece of pasteboard is placed inside of the tire to protect the inner tube from cutting on the wire. Such a repair cannot, of course, be recommended for use over any length of time, but wire is often one of the easiest things to procure in case of such an emergency on the road, and it may save a drive "on the rim."

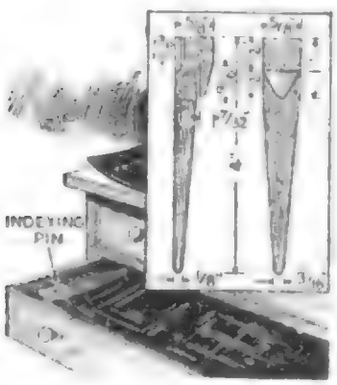
### Drills Ground for Rapid Cutting

In using a small air-driven or breast drill for drilling oil holes, centering shafting, etc., the drill can sometimes be made to "bite" better, and thus drill quicker and easier, by grinding the drill as indicated by the dotted lines in the figure. The idea is to reduce by one-half the total length of the cutting edge. On one side the point cuts; on the other side the lip does the cutting. The objection to this practice is, of course, the difficulty and frequency of grinding. The form indicated at the left will probably be found to last a little better; the one at the right will be a little the easier to form on the grinding wheel.



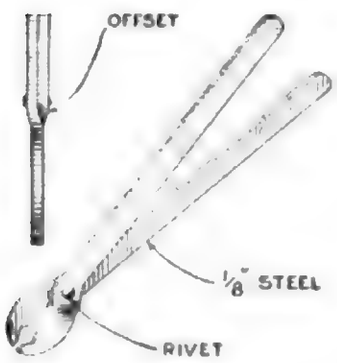
### "Out" Pin Aids in Filing Tracings

Wooden pins, constructed as shown, were used by a drafting-room file clerk, to aid him in keeping track of tracings and blueprints which had been borrowed from his filing cabinet. Two narrow grooves were cut in each pin, as shown in the detail drawing. On withdrawing a blueprint or tracing, its number was written on a paper slip and thrust into the outer groove, and the edge of the sheet immediately above it was thrust into the inner groove. The paper slip projected at the side of the pile of sheets, so that it was easy to find the right location when the missing sheet was to be replaced.—Henry G. Appleblad, West Haven, Conn.




### Handy Pliers for Turning Nuts

The cut shows a very handy tool, which has been used with success in repair work on typewriters and adding machines. It is made from steel, about ⅛ in. thick, and will fit hexagonal nuts over a considerable range of size. The jaws are offset so that they come directly opposite each other. With this wrench one can get into many narrow places where ordinary wrenches or pliers would not fit. To make a durable tool, the jaws may be casehardened after they are bent to the proper shape.

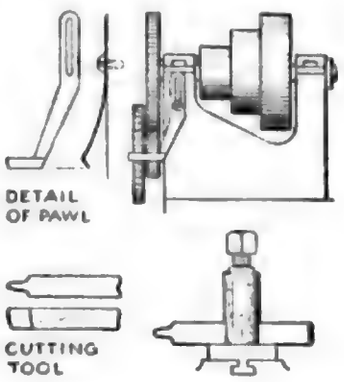



### Valve-Grinding Compound as Polish

Valve-grinding compound, as an emergency substitute for metal polish, has given excellent results on brass and iron. If the metal is very badly tarnished, a coarse grade should be used first, and finer ones afterward; but in most cases the medium, or fine, grades are the best to use. They produce as bright a luster as the best metal polish, and are very easy to work with.

### Gear Cutting in a Lathe

The cutting of gears in a lathe is a process which can be carried out by a number of different methods, but it would be hard to find a simpler one than the one here illustrated. First, a hole is drilled and tapped near the outer end of the headstock, for a No. 8 machine screw. A spring is then cut from a piece of No. 16 gauge spring brass or bronze, to the shape shown at the left. This is to act as an index pawl. The spring, when mounted on the headstock, with its lower end fitting between the teeth of the screw-cutting gears, prevents the lathe spindle from rotating. After the spring is lifted from contact with the gear teeth, and the gears are rotated until the spring fits in the next space between gear teeth, the spindle will have revolved through a certain angle. In this way, by selecting the proper gears, the spindle can be indexed for cutting any ordinary number of teeth. The process of finding by calculation the proper gears to use in any particular case varies with different lathes, but one familiar with the lathe should have no difficulty in working this out, if he understands the simple shop arithmetic with which every machinist should be familiar.




The cutting of the teeth is done by a piece of ¼-in. square tool steel, which is ground by experiment to the proper shape to cut the tooth wanted, and is then gripped directly in the tool post. The main feed of the lathe is used in cutting the teeth; the tool is moved once across the face of the gear blank, and is then moved back and set a trifle farther in, with the cross feed, before the next cut is taken. The depth of the cut should be determined in the ordinary method, or can be found in gear-cutting tables. The tables will not apply, however, unless the tool is accurately ground, so that the root and outside diameters of the gear should be accurately measured after cutting, if possible.

The process is, of course, a very slow one, but in an emergency it is one which may prove very useful.—C. A. Pease, Monrovia, Calif.

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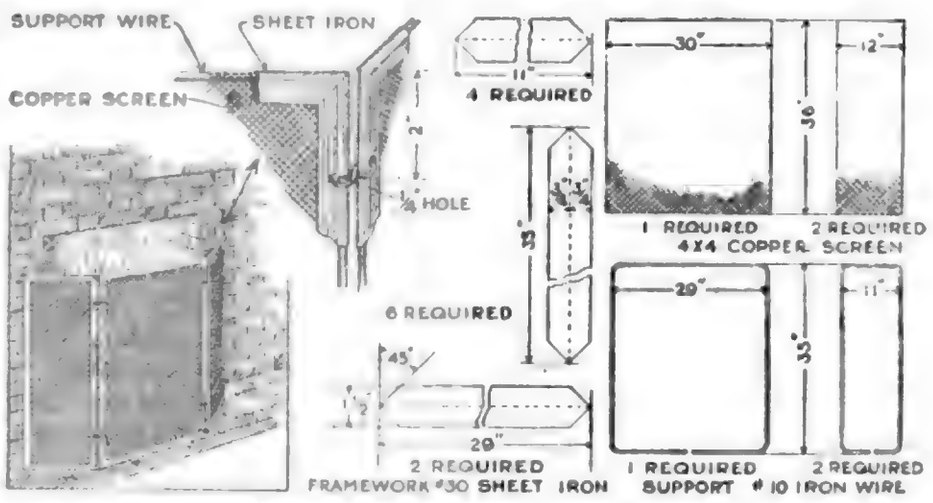
### An Inexpensive Grate-Fire Screen

Fire screens are a necessity if one would leave a grate fire with any feeling of security over night. Upon inquiring the price of these screens at several hardware stores, I found that the very cheapest cost $9, while the better grades went as high as $18. These prices were a bit too high for me, so I set out to make my own screen. The material required consists of 28 sq. ft. of copper screen, 4-by-4 mesh; 24 ft. of No. 10 gauge iron wire, and some strips of No. 30 gauge sheet iron. The labor involved in constructing the screen is as follows:

Cut the screening into the sizes required, and bend the heavy wire into rectangles, as shown in the drawing. Lay the wire rectangles over the mesh rectangles to which they correspond in dimensions. There will be a ½-in. margin of mesh which should be folded back over the supporting wire. Cut the sheet iron into the sizes shown. Bend along the dotted lines, until the edges lack about 1 in. of coming together, and slip over the proper edges of the rectangles of wire and mesh. Press the sheet iron down tightly against the wire, and solder very carefully along the line where the mitered edges meet, to make a good joint.




**An Easy Job of Metal Working, with Familiar Tools, Provides a Thoroughly Dependable Fire Screen at Trifling Expense, and Makes It Perfectly Safe to Leave a Fire Burning in the Grate**

To join the three sections together, drill ¼-in. holes in the sheet-iron margin, as indicated, and bend some of the wire into hinges of the type shown.

The entire cost of my fire screen was $2.35—$2 for the copper screen, and 35 cents for the sheet iron and wire.—D. B. Smith, Mishawaka, Ind.

### Catch Surplus Solder in Water

A certain economy may be practiced in using solder, if a basin of water is used to catch the surplus material as it falls. The disadvantage of using paper is that the solder splashes as it drops onto a resisting surface, and breaks into very small fragments, which cannot be recovered. When, however, it falls into water, it all remains in the basin, where it cools and forms into lumps which are easily preserved.

### Transplanting Old Fruit Trees

To transplant a whole apple orchard, in which many of the trees have been bearing fruit for 20 years, is an undertaking which would daunt the courage of many fruit growers. This feat was accomplished, however, in one of the northern states, to avoid destroying an orchard which lay directly in the line of a new highway. All surplus foliage and twigs were first cut from each tree, so as to preserve the balance between the root and the upper part; this made it possible to abandon part of the root, but to keep enough to nourish the trimmed branches. Each tree was then dug out, with a ball of earth, about 5 ft. in diameter, clinging to the root, the remainder being cut off and left in the ground. A stone boat, equipped with a block and tackle at the forward end, was backed up to the root, and ropes were passed around the tree trunk, which had been carefully padded to prevent abrasion. The tree was thus drawn up on to the boat, conveyed to its new location, and replanted. When in position, the roots were flooded with water, so as to make the new ground unite with the ball of earth left attached to the tree, and the trunk was then mulched with straw for the winter. All the trees were transplanted in this way, and the following season they bore as plentifully as they had ever done in previous seasons, while occupying the location where originally planted.

¶ For work on enameled surfaces, the rubber tip used on the end of an invalid's crutch can be fitted to the striking surface of a hammer.

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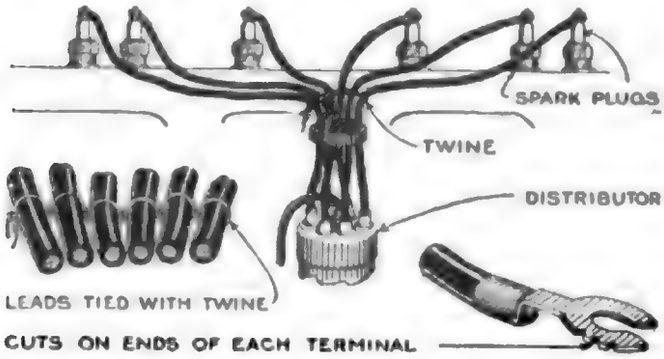
## Spark-Plug Leads Easily Located

When the high-tension wires leading to the spark plugs of an automobile engine are disconnected for any reason,

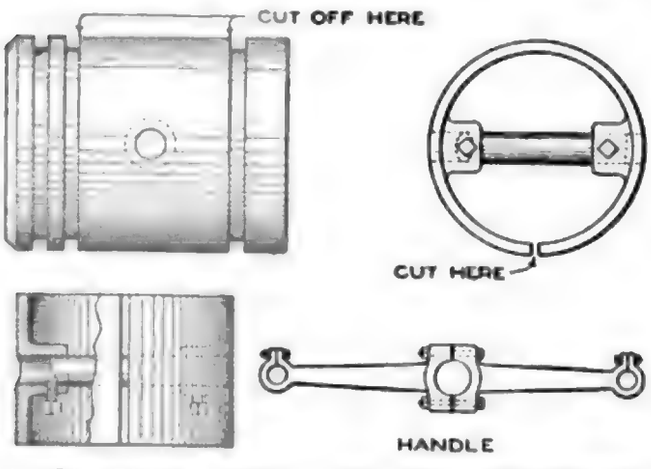



**Confusion in Replacing Spark-Plug Leads may be Avoided by the Use of Either of Two Simple Methods of Distinguishing Them**

some trouble may be encountered in replacing each lead on the proper plug, unless the leads are marked in some way to identify each one with its plug. Two methods of doing this are illustrated. Before disconnecting the wires, a cord may be tied around each of them, beginning with the wire leading to the plug at one end of the engine and ending with the wire belonging to the plug at the other end cylinder. The cord may then be left permanently attached, and if two or more leads are disconnected at the same time, they can be easily replaced. Another method is to cut notches in the terminals, one notch for the wire belonging to the first cylinder, two for that leading to the second cylinder, and so on.

## A Tool for Fitting Pistons

It often happens that an oversize piston is too tight, even after the cylinder



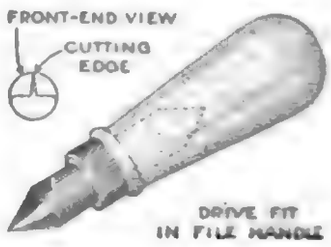

**An Old Piston Forms a Tool Which Smooths Reground Cylinders to Make Oversize Pistons Slide Freely**

has been reground. A tool for smoothing down the cylinder wall, to overcome this difficulty, can be made from one of the old pistons. The two ends of the piston are cut off, as the piston-ring grooves are not needed. The piece left is split down one side, as shown, making it possible to expand the tool. The expansion is controlled by a change made in the wrist pin and the lugs it fits into on the inside of the piston. Through one of these lugs, a hole is drilled and tapped for a 5/16-in. setscrew. The wrist pin is then annealed; one end is cut to form a slanting face, and in the other end a 5/16-in. hole is drilled. The pin is then hardened.

In assembly, the pin is held in place at one end by the setscrew through it and the lugs in the piston wall. When the setscrew in the lug at the other end of the pin is tightened, it presses against the slanting face, and forces the pin away from the screw, thus expanding the piston. In use, the tool is placed in the cylinder, with a handle of convenient length fastened to the wrist pin, and the setscrew is tightened until the piston makes a close fit. Then, after putting some valve-grinding compound in the cylinder, the piston is worked up and down until it moves freely. It is again expanded to fit tightly, and the smoothing continued until the new oversize pistons will fit as they should.—Edwin Schubach, Chicago, Ill.

## Center Scraper for Lathe Work

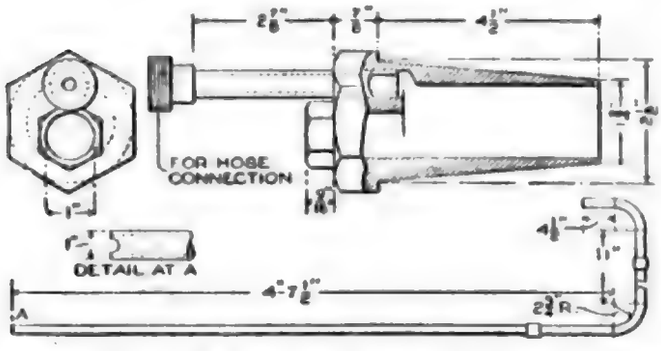
When the center hole in an arbor or shaft has been battered so that it will not center properly in the lathe, the tool illustrated will be found useful. It is merely a round piece with a 59° point turned on it, and two flutes cut out, leaving cutting edges at the sides of the taper. The tool may be made from ½-in. drill rod. It is well to make it double-ended, so that either end may be thrust into the handle, exposing the other end for use in cleaning out the shaft centers. It has been found advisable to use the 59° included angle in order to compensate for the slight rocking due to hand operation. The side of the taper which is not cut out should be very smooth, to serve as a guide for the cutting edge. All other corners should be rounded off and smoothed before the tool is hardened.—F. W. Runge, Elmira, N. Y.



## Forcing Oil from a Barrel by Air Pressure

If the only hole in a barrel of oil is at the top of the barrel, it is difficult to remove small quantities of oil when needed, unless a siphon or pressure device is provided. The drawing shows a plug, to be screwed into the bunghole, which quickly provides means of applying air pressure to force the oil out. Its diameters at the ends of the taper thread, 1¾ in. and 2½ in., enable the plug to be applied to almost any barrel. It must be screwed in pretty tightly, to minimize leakage of air.

The air hose is attached to a small pipe which projects upward from the plug, and which is provided with a suitable thread for connecting the hose. This small pipe may be screwed or driven into the plug, or may be cast solid with it. The larger hole in the top of the plug is 1 in. in diameter, and the long pipe, of 1-in. outside diameter, is thrust through this hole until its lower end rests on the




A Barrel of Oil is Emptied through the Hole in Its Head by Screwing in This Plug and Applying Air Pressure

bottom of the barrel. This bottom end is cut out to enable the oil to flow into it. Above the 1-in. hole the metal of the plug projects a distance of 9/16 in., in order to give additional bearing surface for the pipe. The long pipe should be a rather close fit in the 1-in. hole, so as to reduce leakage, though if there is plenty of air, a tight fit is not so essential. Even with a pressure as low as 4 to 6 lb. per square inch, the oil will flow readily.

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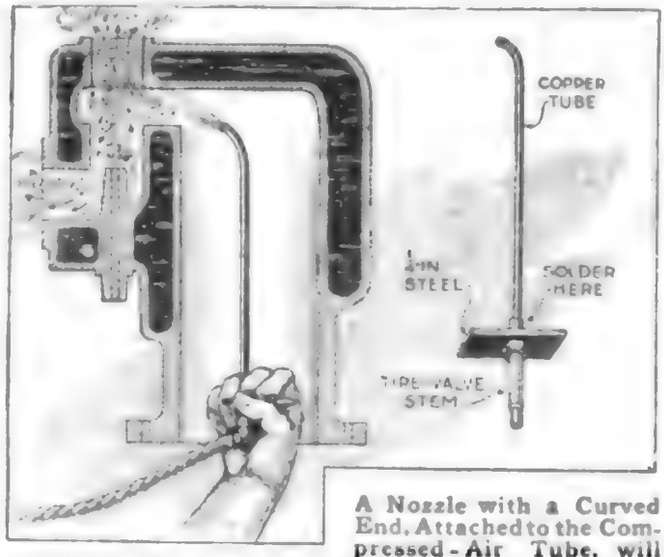
## Cutting Glass under Water

When the amateur mechanic has occasion to cut a sheet of glass, and has no glass cutter at hand, he can do a very satisfactory job with a strong pair of shears. The task can be accomplished by holding the glass under water, after making guide marks on the sheet.

## Air Nozzle for Garage Use in Scraping Cylinders

Any mechanic who has overhauled a gasoline engine and scraped the carbon




A Nozzle with a Curved End, Attached to the Compressed-Air Tube, will Satisfactorily Assist in Cleaning Carbon Out of Automobile Cylinders

out of the cylinders will appreciate the little device illustrated. It is merely an auxiliary air pipe which is fitted onto the end of a compressed-air hose for injecting a blast of air into the cylinders, to rid them of the loose flakes of carbon dislodged by the scraping tools.

The air pipe is made from a piece of ¼-in. copper tube, its length depending on the depth of the cylinder to be cleaned. One end of the pipe is slightly curved, to enable the operator to force the blast of air into the valve chambers. The other end is soldered to the body of an old tire valve. A piece of steel, of convenient shape to assist the hand in holding the tube, is then threaded onto the valve stem, fastened with a nut, and soldered. This little device, which may be made in a few minutes, will save hours of valuable time on overhauling jobs.

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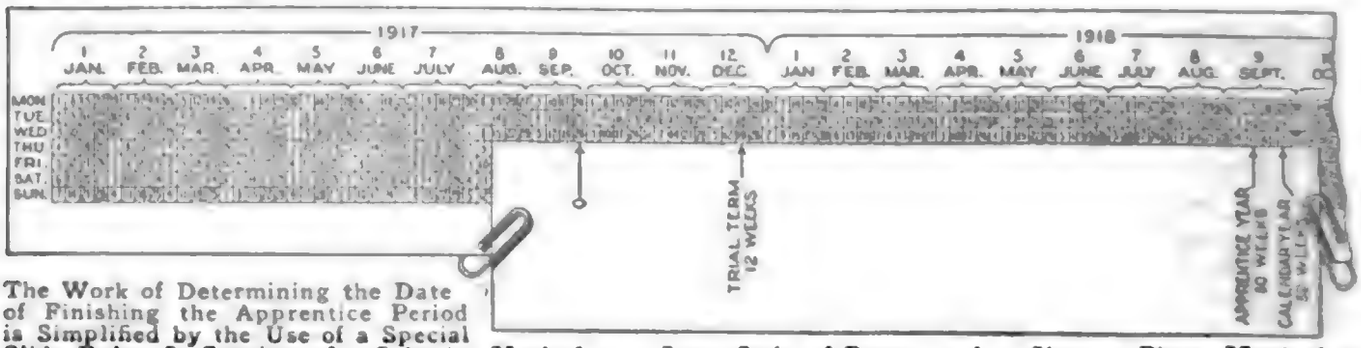
## Linoleum for the Poultry House

Henhouses with walls which are not completely weatherproof can be found on hundreds of farms and in many back yards. The owners are satisfied with walls which provide some shelter but do not entirely exclude drafts, and this is a common cause of sickness among the poultry. Discarded linoleum makes a very good reinforcement for walls and roof, and, as it is very speedily attached, the poultry keeper can remedy the defect with hardly any expenditure of time or money.—J. T. Bartlett, Boulder, Colo.

### Calendar Used Like Slide Rule

A man in charge of the apprentices of a large manufacturing plant found the task of reckoning the termination of each boy's apprentice period greatly simplified by use of a special calendar of his own construction, to which he attached a simple slide, marked to indicate periods of various lengths. The usual rules governing apprentices required them to put in so many years of 50 weeks each. With each boy starting at a different time, and with each boy out a longer or shorter period on account of illness or vacation, it was not easy, by ordinary methods, to tell when his year ended.

The calendar was made by numbering the days on a single strip of paper, each week running down across the strip. If a small calendar can be obtained with the numbers arranged in this fashion, the months may be pasted side by side, care being taken to fit the ends and beginnings of months together with great accuracy, so that they make full weeks. The whole ribbon covered the four years of the apprentice period, and a little more. The slide consisted merely of a strip on which was a zero mark, and three other marks, properly spaced. One showed the distance 12 weeks, the trial term, would occupy on the calendar, the next mark showed the space occupied by 50 weeks, and the last one 52 weeks.




The Work of Determining the Date of Finishing the Apprentice Period is Simplified by the Use of a Special Slide Rule. It Consists of a Calendar Marked on a Long Strip of Paper, and a Shorter Piece, Marked to Indicate Periods of Various Lengths, Which Forms the Slide

To use this device to determine when a boy's year ends, the slide is placed so that the zero mark falls on the week in which the boy's year began. The 50-week mark will then show instantly in what week the end of that period falls, whereas by calculating from an ordinary calendar there is a big chance for a mistake, particularly as there are fractions of weeks on each month's page. In case the boy has been out a number of days during the year, the user of the device merely counts ahead that number of days on his calendar from the point indicated. The other periods are calculated the same way.

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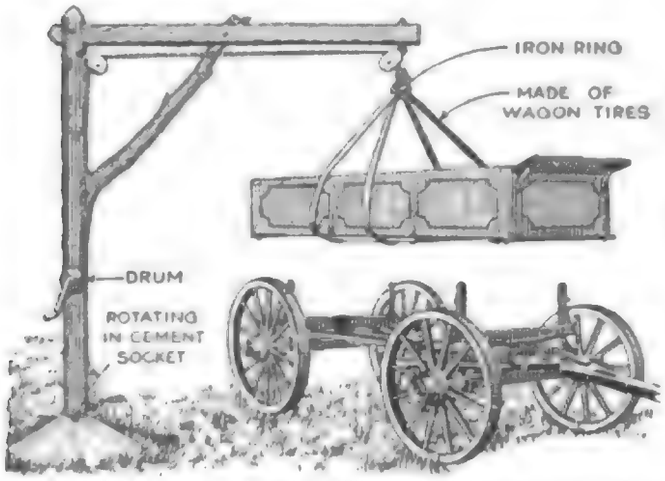
### Crane Rotates in Stovepipe

On the farm it frequently happens, at busy times, that two or three men are called away from their work to assist in removing a wagon body from the running gear, or to replace it with a hayrack. Numerous devices are constructed for such jobs, but the one shown in the illustration, which was erected by a Virginia farmer, is certainly to be reckoned among the best.




A Handy Crane for Farm Use is Made of a Forked Tree Trunk, Thus Simplifying Construction and Giving Great Strength

The perpendicular post is a forked white oak trunk, 6 in. in diameter, with an 8-ft. crosspiece bolted to it. The four hooks are made of wagon tires, fastened to a ring made from ½-in. round iron. A stout rope is fastened to the ring by a detachable hook, and runs through pulleys down to the crank-operated drum.

By lowering the hooks and attaching them to the corners of the wagon box, a boy can easily raise the box from the gear. As the upright post is placed in a cement socket, the wagon box can be lowered to the ground and the crane turned in the opposite direction to raise the hayrack or other box. By driving

around to this side, the rack can be lowered onto the gear.

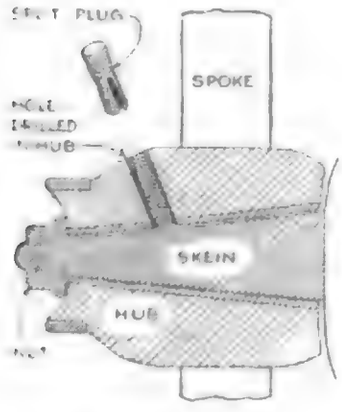
The hooks may be removed and hung against the post out of the way, leaving the derrick free for other purposes, such as hoisting a cow or pig when butchering.

To make the cement socket, a hole was dug, about 2½ ft. deep and the same diameter; a few inches of cement mixture was poured in, to cover the bottom, and left until almost set. A stovepipe was then placed exactly upright in the center of the hole, and concrete was filled in around it and built above the ground in the shape of a cone. The pipe can be removed or not, as desired.

Two grooves across the top of the cone, and a hole in the post at the corresponding height, make it possible to insert a bolt which locks the crane in any position.

## Wagon Greased without Removing Wheels from Axles

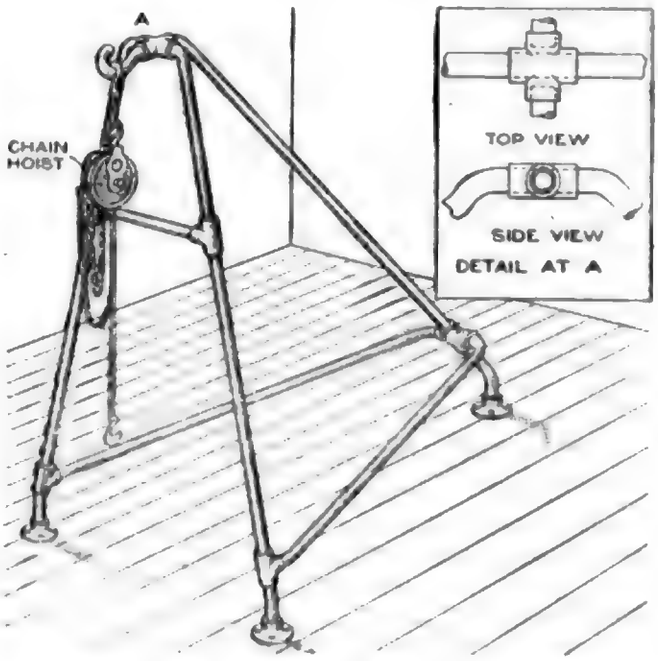
By fitting the wagon wheels with grease cups, as shown in the drawing, it is possible to grease the wagon as often as necessary without removing the wheels. This is a great help in the summer when the wagons are doing heavy work continuously, and when the grease runs out at both ends of the hubs because of the heat. The grease cup is simply a ¾-in. hole drilled entirely through one side of the hub. A plug of hard wood, with a screw eye in one end and slotted with a saw cut at the other end, fits into the top of the hole. It should fit tightly, the slot making it grip the side of the hole firmly. To grease the wagon, remove the plug from each grease cup, and force the grease into the holes with a stick or grease gun, such as used for autos. There is always a little space between the skein and hub, and this space is easily filled with grease by means of the grease cup. Since the method can be used when the wagon is loaded, there is no excuse for running on dry skeins.




A mandrel used in babbitting will come out more easily if coated with white lead.

## Portable Hoist of Pipe and Fittings

A portable hoist, suitable for use in an automobile-repair shop, can be made of lengths of pipe and pipe fittings, the only tools necessary being a pipe cutter and a threading tool. Its usefulness will be demonstrated every time it is necessary to remove a motor, transmission, or other heavy unit.




**A Frame to Support a Tackle Block is Made of Pipe and Fittings, and Saves the Cost of Expensive Hoisting Apparatus**

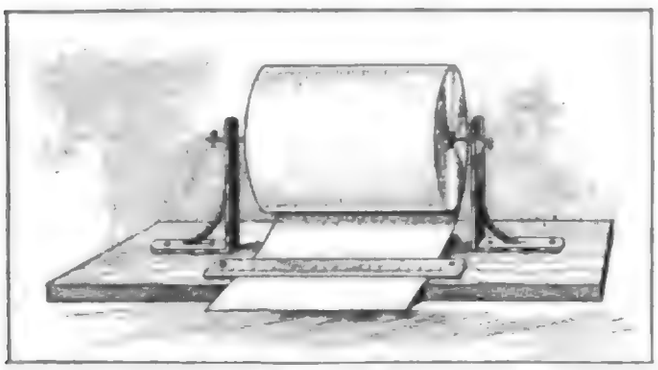
The example shown in the illustration is of the tripod type, three inclined pieces of pipe forming the legs, with three horizontal sections serving as braces for these members. The joints are made of tee connections, while ordinary floor flanges are used as feet. The portion supporting the tackle block is of the type of fitting called a "cross," and the hook that holds the chain is formed by one of the legs, which passes through the cross and is bent afterward. This makes a stronger support than a hook screwed into the cross, as the latter form of construction might cause excessive strain on the threads.

## Empty Gasoline Tanks Are Dangerous

A full gasoline tank is never as dangerous as an empty one is likely to be. A little gasoline, remaining in a tank, vaporizes easily and forms with the air a dangerous explosive mixture. Therefore, if soldering or other work is to be done on an empty tank, care must be taken to keep all flames at a distance from the work.

### Holder for Wrapping-Paper Roll

A grocer, annoyed by the sudden breaking of a holder for roll wrapping



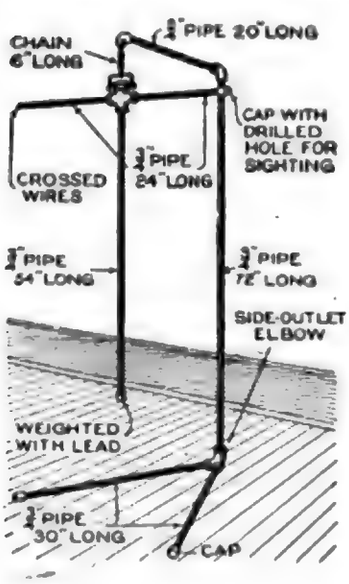
**Two Shelf Brackets and a Ruler, Mounted on a Board, Form an Efficient Rack for Paper Rolls**

paper, quickly mounted a substitute, shown in the drawing, and has, so far, not bought a new holder. Two light shelf brackets were screwed to a board, at about 12 in. distance from each other. The upper screw holes in the upright legs were exactly in line. Through these he slipped a light steel rod, with a right-angle bend at one end, and a small cotter pin at the other. The end of one bracket was slotted for greater convenience in changing the roll of paper.

A wooden ruler, attached to the board by screws through both ends, with washers underneath, formed a convenient straightedge for tearing off paper.

### Builders' Level Made from Pipe

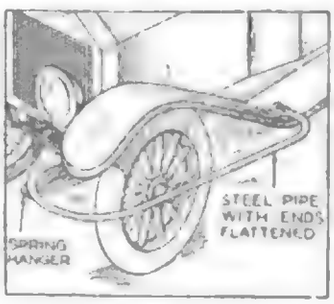
The builders' level here shown was made inexpensively of pipe fittings, all purchased at a plumbing-supply house.




A pendulum, made of a piece of pipe, hangs from a chain, and is capped at the lower end. This lower end is partly filled with lead, and, as the chain is flexible, the pendulum is always vertical. Two other pieces of pipe are attached to the top of the pendulum on each side by means of a cross, which makes them perpendicular to the pendulum, and, as they are of equal length, they counterbalance each other, so that their horizontal position is permanently maintained. These serve as a telescope. The chain is fastened to the top of the cross by wires and a ring, the latter passing around the top of the cross just below the flange, so that a swivel joint is formed which enables the telescope to be turned easily in all directions. One end of the telescope is covered with a cap with a small hole drilled in it for sighting, and crossed wires are placed at the opposite end.—D. W. Daley, Parkersburg, West Virginia.

### Safeguarding the Left Front Wheel

When a motorist had experienced two accidents by colliding with projecting hubs of trucks at night, he devised and had installed a simple guard to protect the hub of the wheel from being struck and consequently deflected to the side, with damage to the car.




The attachment was made of a piece of steel pipe, attached at the front to the horn, or spring hanger of the car, flared or bent outwardly and back, partly encircling the wheel, then fastened to the left running board.

The piping is far enough from the outside of the wheel hub to permit tire removal, the space at this point being wider than the tire, and the pipe slightly above the hub. Were an accident to occur due to striking at the side, the front end would only be pushed over, without wrecking the steering control.—G. A. Luers, Washington, D. C.

### Paper Grease Gun for Emergency

To fill the transmission, or differential, case of an automobile with grease when no grease gun is available, is a task calling for some ingenuity. One motorist met the difficulty by making several cone-shaped tubes of heavy paper, the small end of each being made to fit the holes in the cases. He filled each cone with grease, placed the small end in the filling hole, and folded the paper over the grease, squeezing its contents toward the hole. In this way he crushed the cone together, and forced all the grease into the case.—Bernet S. Swanson, Chicago, Ill.

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# A Three-Mirror Bathroom Cabinet

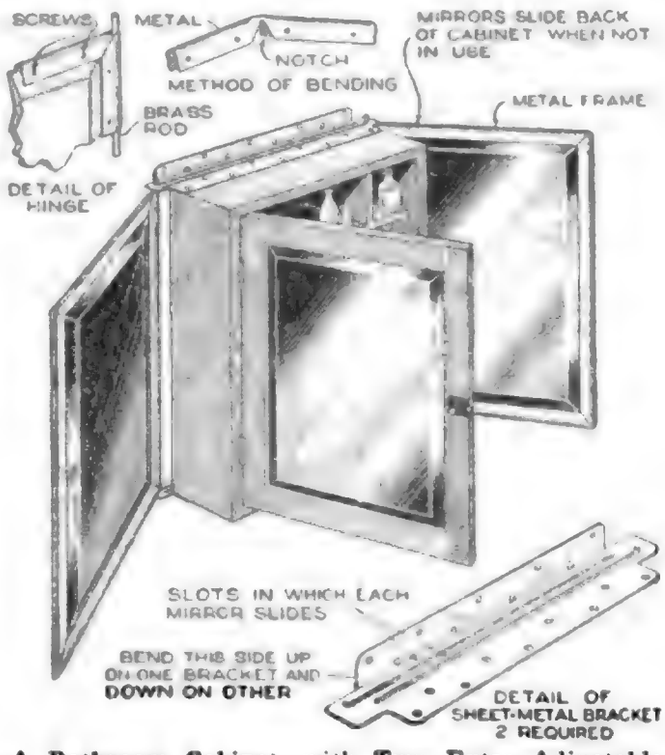
By DALE R. VAN HORN

AN improved bathroom cabinet, with the advantage of three mirrors instead of one, may be easily made at home. The chief merit of this cabinet is the fact that the two side mirrors may be put out of the way when not in use. They are so arranged that they slip behind the cabinet, and are pulled out and placed at a convenient angle when wanted.

The cabinet consists of a box of hard wood, 16 in. wide, 4 in. deep, and 22 in. high. The four or five shelves which may be provided are of any suitable ½-in. material that will work in well. These are put in place as shown, and are narrower than the depth of the cabinet to allow for the thickness of the door. The front-panel mirror, which should be a good thick one, is put in in the usual way. It may be beveled if desired.

For the two side mirrors, the same heavy weight of glass is used. These mirrors are the same size as the back of the cabinet, and are bound in heavy copper or galvanized iron. The upper details show the manner in which the glass is bound. The sheet metal is cut in strips, 2 in. wide, and bent over the edges of the glass, being beveled at the corners to fit. The two hinges consist of ¼-in. brass rods, and are 2 in. longer than the height of the mirrors. They are inclosed in the metal binding of the mirrors as shown, with 1 in. projecting from each end. The metal is finally made solid either by soldering the corners, including the brass rods, or by drilling through the side strips and the hinge and driving in small pins, soldering being preferable. Care should, of course, be taken, to prevent breakage of the glass due to heat. After soldering, a file will smooth joints before painting.

For the rest of the cabinet, two pieces of heavy sheet metal are cut, as shown in the lower detail. These are 3 in. wide, and 1½ in. longer than the width of the cabinet. To cut the slots, the best way is to bore holes at the extremities and then, with a file, scratch the outlines of the slots a number of times, until the strips of tin may be easily punched out. Holes are then bored for wood screws, and the back side bent up to fit against the wall, as shown. These strips of metal will be sufficient to hold the cabinet against the wall, but it will require a small shelf to rest upon. This may be of any material, and is out of sight.




**A Bathroom Cabinet, with Two Extra Adjustable Mirrors at the Sides, will Be Very Useful without Occupying Much Space**

The action of the two extra mirrors is obvious. Due to the arrangement of the slots for the ends of the brass rods, it is quite easy to pull out the mirrors whenever desired, and push them back out of sight at times when the center mirror only is required.

Give the inside of the cabinet two coats of white paint, and finish the outside either in the same color, or any other to harmonize with the rest of the room.

A bathroom cabinet of the common variety may be provided with this same set of mirrors.



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### Airplane Glider Made of Feathers

One of the most interesting of the many types of toy airplanes now being made is the one shown in the photograph.

Feathers Which can be Picked Up in the Barnyard Form the Wings and Tail Planes of a Glider, Which, for Lightness of Wing Construction, Is Unexcelled

It consists of a number of feathers, stuck into ordinary corks and mounted on a fine sliver of hard wood, 5 in. long. The large feathers, which in this case are 7½ in. long, form the wings of the glider, and the small ones at the rear form the stabilizers. Of the three corks, the central serves as a handle for holding the glider when flying it, but chiefly as a weight to adjust the glider for balance. It should be moved forward or back until the proper position to give the best flight is found. The angles at which all the feathers are set will have to be taken care of very carefully, as it is easy to prevent the glider from working at all by simply having a little more angle of incidence in one wing than in the other. One who knows something of the shape and placing of airplane wings and tail planes, will find the proper arrangement of the feathers with very little experimenting. — Vincent J. McMurtry, Chicago, Ill.

### Leather Strips on Bicycle Tires

Cyclists who use single-tube tires of the cushion-pneumatic type may practice economy by wrapping them in leather straps; this is a dependable way of preserving them, and saves the cost of new tires. Procure some small leather straps, ½ in. in width, and join them together with small rivets, preferably of the clincher type. To make these joints smooth, taper the parts which are to overlap by slicing them with a sharp knife, thereby preventing ridges from being formed. Partly deflate the tire, and wrap the leather around the rubber until it is completely covered; then fasten the ends together with a buckle, and pump the tire up hard. The leather must be occasionally removed and cleaned, as dust and sand will work under it, but it will need no other attention. The straps for both wheels will cost about $3, but they will last for years, and will effectually prevent punctures.—Robt. C. Knox, Rogers, Ark.

### Electric Bell as Nursing Aid

A convalescent recovering from a serious operation was warned by the surgeon not to lie on his back, but he constantly took that position in his sleep. Tying the body and limbs prevented him from resting, so a wood push button was fastened to a cloth bandage and strapped to his back. This made a night nurse unnecessary. As soon as the patient turned on his back the bell warned him, and thereafter he was able to go to sleep without danger.—V. H. Todd, Orange, N. Y.

### Wrist Watch Seen through Gauntlet

The usefulness of wrist watches, to motorists, airmen, and others, is seriously impaired by the fact that the watch cannot be seen through the gauntlet. The method used by a California flier is to make a hole in one gauntlet, 4 in. in diameter, and cover it with a piece of heavy transparent celluloid, stitched into the leather, the hole being so located that the window comes directly over the wrist watch, and permits observation of it without admitting air or dirt to the wrist.—John E. Hogg, Los Angeles, California.

The Airman's Gauntlet is Provided with a Window through which His Wrist Watch is Visible

### Photos Reproduced without a Camera

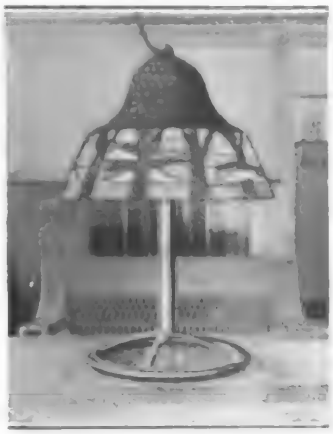
To reproduce an unmounted photograph without using a camera, place it, face downward, on a piece of contrast paper. Lay the two pieces in an ordinary printing frame, the photograph to be reproduced being next to the glass. Hold the frame in bright sunlight for a few seconds, the exact time depending on the density of the photograph, the thickness of the paper, and other factors. Then develop the print in the usual way, and if the exposure and development have been correctly timed, the result should be a clean-cut negative or reversed print. To obtain a positive, duplicate the process, using the negative instead of the original photograph.—Glen D. Fleak, Opelousas, La.

### Door Knob as Faucet Handle

Those who travel a good deal are likely to be familiar with the problem of the faucet with the missing handle. In such a case the square head usually remains, but a wrench is necessary to turn it. It is often possible to find a door knob which fits the head, and it makes an excellent temporary substitute.

### Lamp Base Made from Steering Post

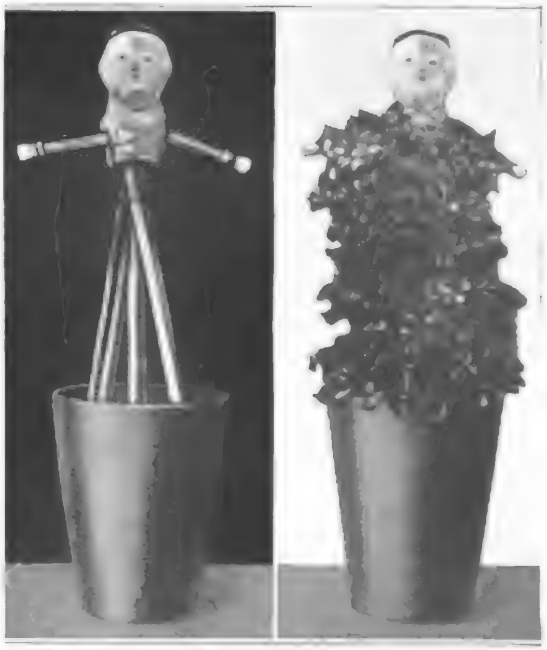
When an old worn-out automobile, with which many pleasant memories may be associated, is finally consigned to the junk heap, good use can be made of the steering wheel in the manner shown in the photograph. The wooden part of the wheel can be easily refinished, and part of the column provides an excellent standard for a table lamp. Suitable fixtures for mounting the lamp at the top of the column may be readily purchased at an electric-supply store.



When a section of stovepipe is too long to make a good fit, the superfluous part can be cut off with a can opener.

### Living Plants Form Doll's Dress

The photographs show a novel idea which may furnish amusement to those who like to grow things indoors. In a flowerpot is set a little framework of thin wood or bamboo, on the top of which are fastened a doll's head and arms. In the soil below are planted the seeds of some small flower plant or vine. Such seeds as nasturtium, morning-glory, spiderwort, and several others, are suitable for the purpose. As these little creepers grow, they are trained up the framework, and thus the doll is provided with a dress of living growth, the effect of which is quite striking and altogether novel.



Vines Growing up the Framework, Which Constitutes a Doll's Body, Provide It with a Dress of Living Foliage

### Old Oilstone may be Made into a Circular Stone

An old oilstone, which was too small to be useful in the ordinary way, was cut to a nearly circular shape with a hacksaw, and a ½-in. hole was bored in it for a shaft. Mounted on a ½-in. bolt, with a pulley at the other end of the bolt and bearings between, this formed a useful circular stone. The stone was smoothed down, after it was set running, by the use of a sharp piece of steel. It was found useful for smoothing out the scratches left on metal work by an emery wheel.—R. Swan, Herman, Neb.

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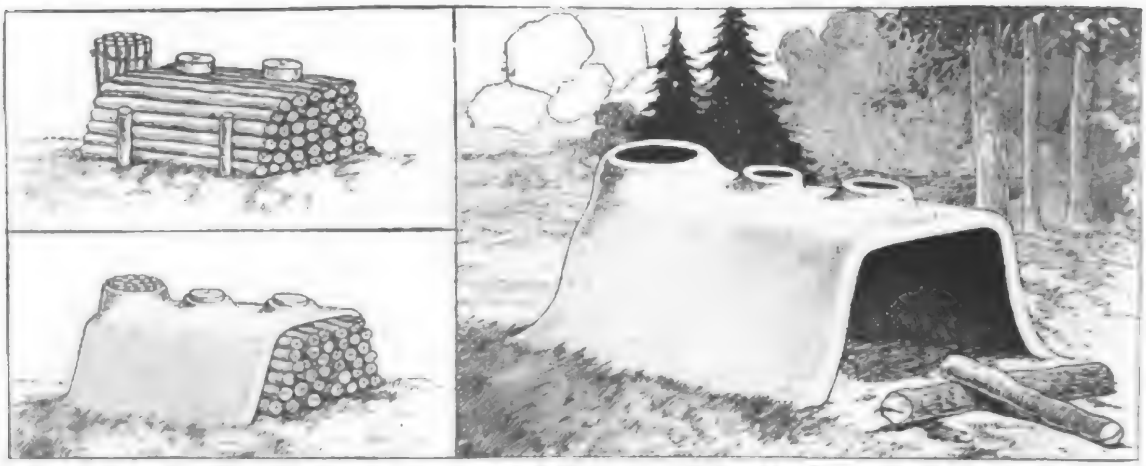

A Dutch Oven Is a Valuable Asset to the Late-Fall Camper, as It Provides Means for Cooking a Steaming Hot Meal. It is Made without Other Materials Than Clay and Firewood

## A Dutch Oven for the Camp

The relish of food cooked in a camp over a wood fire in the open will never be forgotten by the occasional camper. Not many have tasted pastry cooked in an old-fashioned Dutch oven. This oven is first heated by building a fire in it; then, when the oven reaches the proper temperature, the fire is raked out and the food placed in it. The resulting flavor of wood smoke appeals to most campers.

The illustration shows how to form the clay for such an oven, and bake it to shape. Procure a number of straight sticks and poles, 3 ft. long, and make a pile of them as nearly square as possible, 18 in. each way, driving stakes at the sides to hold them in place. At the end of this pile, stand a bunch of the sticks on end, making the bunch round and about 8 in. in diameter. The sticks can be tied together with a stout cord, or with a twisted rope made of hay.

On top of the main pile, place one or two pieces of wood, cut from a log or limb of a tree, 6 or 8 in. in diameter; these are to form holes in the clay top.

When the poles are built up as described, they are ready for the clay covering. The clay must be selected with care, as much depends on the quality and the mixing. A hillside may produce the right kind, either blue or yellow. Mix this to a paste with water, and apply a coat over the wood, about 2 in. thick, covering it with earth, except the front end of the sticks, the top of those standing vertically, and the wood blocks. After the covering is completed, the oven is ready for firing, which is done by removing the large pieces of wood from the holes in the top, and building a fire under the sticks inside the oven.

In cooking, this furnace may be used as a stove or a Dutch oven. A trench is dug on the inside, over which green limbs, or iron bars, are placed like a grate, to hold the burning fuel. When using it for a Dutch oven, a fire is made in it and kept burning until the walls are thoroughly heated; then it is raked out, and the food to be cooked is placed in it. The oven should be quite well sealed during the cooking period.—Charles R. Fisher, Chicago, Ill.

### Indirect Illumination Provided

Any person who suffers from weak eyesight is at a serious disadvantage if he is obliged to do much studying by artificial light. When not so engaged, he should rest his eyes by avoiding strong illumination, and where an incandescent droplight is used as a reading lamp, with an ordinary conical shade, it is possible to obtain a subdued light by hanging the shade upside down, so that the light is reflected from the ceiling, instead of coming directly from the globe. To make this adjustment, punch small holes around the rim of the shade, fasten a short string to each hole, and tie all the strings together in such a way that the knot will be the same distance from each hole. Tie a cord to the knot, and pass it through a screw eye fastened to the ceiling about 2 ft. from the upper end of the lamp cable, allowing the free end to hang down. Pulling the cord inverts the shade, so it will hang evenly, with the globe in a vertical position.

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### Repairing a Worn Wire Grip

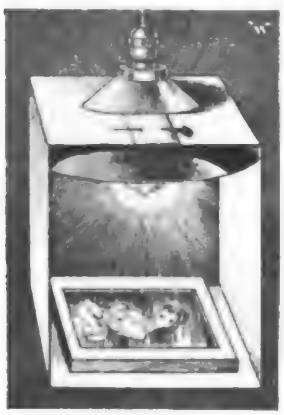
When a wire grip refuses to take hold of the wire, the job may be finished by slipping an old flat file into the grip with the wire. The teeth of the file are held against the wire by the clamp, and hold perfectly.

### Restoring Gloss to Straw Hats

A straw hat which has been cleaned with chemicals does not always retain its original gloss after the operation. Coat the hat with a thin solution of white shellac after it has been cleaned and dried, and the glossy appearance will be restored.

### Suspended Printing Frame

The amateur photographer works at a disadvantage when printing, if he is obliged to use a light suspended from the ceiling by a short cord. An extension cord will relieve him of the fatiguing work of holding his frame near the globe, but it will not guarantee that the distance between the source of light and the frame will be constant. This condition is important, however, and a dependable expedient is shown in the sketch. Cut a long piece of stiff cardboard, a little wider than the frame, and fold it as shown, so that it forms a box with two of the sides open. Lay it out flat again, and cut a segment of a circle from each end. It will be noticed in the illustration that the conical lamp shade passes through the opening formed, after the ends have been joined together at the top. It is necessary, therefore, that each segment should be more than a semicircle, so that sufficient board will overlap to provide material for fastening the ends together. Both segments should be scribed with the same length of radius, so that they will fit the conical shade at the same distance from the apex. If the pins or wires which secure the ends are 2½ in. long, or more, the cardboard is not likely to buckle at the top, or to lose its rigidity.—Hugh N. Anderson, Ste. Agathe des Monts, Quebec.



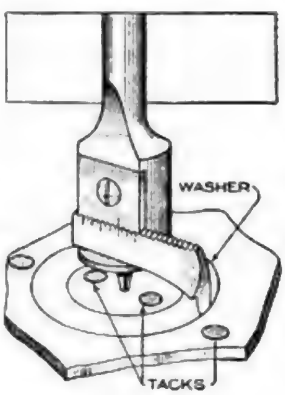
### Running-Board Dog Carrier

While some dogs may sit quietly on the running board of a car speeding over rough roads, the addition of a wire basket will provide safety against an accident to the dog as a result of an extra-violent road shock. The basket may be readily fastened to the running board with staples or loops of wire.

People Who Like to Have a Dog on the Car, but Have No Room for Him, may Find the Running-Board Wire Basket Convenient

### Washer Cutter Made from Old Expansion Bit

When the lip on the body of an expansion bit is worn off, or the worm has been blunted, the tool is too often thrown away. It can be easily made over into a tool to cut disks and washers. All that is necessary is to grind down the cutter and the remains of the body lip, and to file the worm to a smooth, round point without making it sharp, so that it will revolve in the material which is to be cut, but will not penetrate it. Soft metal, leather, fiber, and similar substances, can all be cut with this tool. When disks are to be cut, the material is tacked down in two or three places just outside the periphery, but if washers are to be turned out, the center portion is tacked down and the outside circle cut first, the washer being held in this way until the complete inner circle has been cut.—Henry Simon, Laguna Beach, Calif.

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# AIR-PROPELLED SLEDS AND ICE BOATS

By F. W. Ranston

NOT the least of the contributions which aeronautics has made to other branches of engineering is the application of the air propeller to transportation over ice and snow.

An attempt will be made here to describe very briefly several types of air-propelled vehicles traveling on skis or runners. All of these are homemade, using ordinary motorcycle or automobile engines, and designed merely for carrying one or two persons, at a rather high rate of speed. In the case of the first outfit illustrated, the features of the construction will be described in considerable detail; the others are illustrated chiefly as presenting suggestions to those who may prefer a construction a little different from that of the sled in the photographs on this and the next page.

This first sled embodies many airplane features besides the propeller; it is designed for travel over either snow or ice. The making of it calls for parts that can be taken from a motorcycle which might otherwise be merely laid up for the winter. When summer returns, the parts can be restored to the motorcycle, or pontoons can be substituted for the runners, to form a hydroplane.

As seen in the drawing, the frame is made of 1 by 2-in. yellow pine, and the outside is reinforced with ⅛ by 2-in. band iron, bolted to the side. This forms a frame which is stiff as well as tough. At the rear, the frame members will have to be brought together, as shown, and attached to a block; to get the wood to bend to the curve required, it will be necessary to steam it or soak it in hot water.

The runners are made of ½ by ⅛-in. ash, 5 ft. long. They are provided with cleats to prevent whipping. The ends are steamed and bent to an angle of approximately 45°. The bottoms of the runners are covered with No. 18 or 20 gauge sheet steel. In the center of each of these wide runners is a ¼ by ½-in. sharp steel runner, welded to the center of the sheet-iron bottom. The runners are supported by brackets which swing

Built along Strictly Aeronautical Lines, This Machine Embodies Lightness and Speed Together with a Considerable Degree of Safety. The Sled is Steered by the Use of an Air Rudder as Well as through the Front Runners



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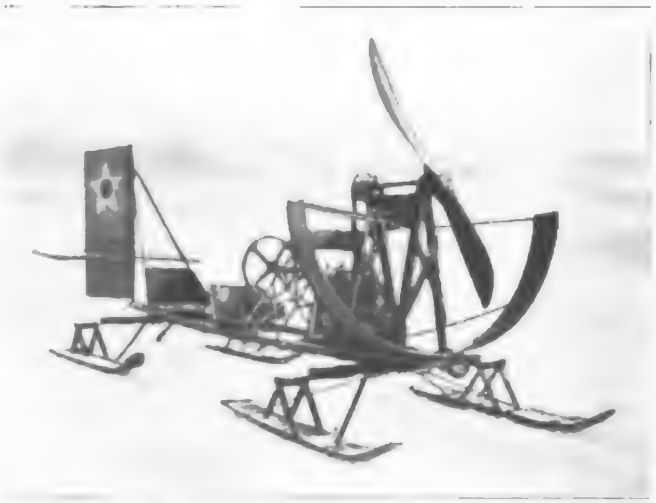
around the ends of the front axle, enabling them to remain in contact with the road, even if the surface is irregular. The front axle is pivoted to the center of the frame for the spring. The steering gear consists of two wheels, pressed and riveted to a 1-in. steel pipe, one of which is an automobile steering wheel and the other a pulley, to take a ⅛-in. stranded steel cable. The shaft or steering column is supported by a bracket made from band iron. The cable is fastened around the pulley, and run through two smaller pulleys to the ends of the front axle. A turnbuckle is provided in this steering cable to take up slack whenever it develops. To the rear of the frame are applied two rudders, one vertical and one horizontal. They are attached by means of an upright piece of hard wood, supported by two similar pieces reaching in a slanting direction to the sides of the frame. The vertical rudder is connected, by cables along the frame, to the pulley on the steering column, so that the rudder turns in a direction corresponding to that in which the front runners are turned. The air rudder is found to be of assistance in steering when traveling at high speed on ice. The horizontal rudder is adjustable, so that the rear end can be elevated slightly when traveling without a passenger. The rudder thus helps to prevent the pull of the propeller from lifting the rear runners off the ice.

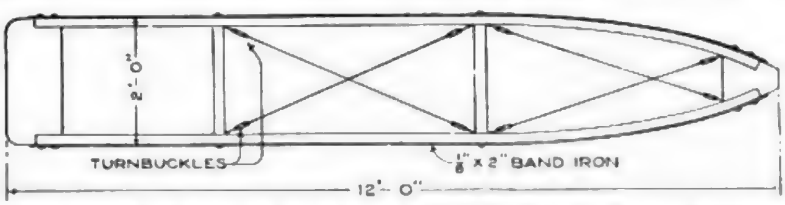


Another View of the Airplane-Type of Sled: The Propeller Guard Is a Feature without Which No Such Vehicle can be Considered Safe to the "Innocent Bystander"

The propeller used is 5 ft. in diameter, and is shaped to a pitch of 4 ft. It is made of pine boards glued together, and is 4 by 6 in. in cross section before carving. It is mounted on a bracket made of yellow pine, which is bolted to the front of the frame. A number of ⅛-in. stranded steel cables with turnbuckles at the end are run from the top of the propeller bracket to the frame, to prevent the vibration from loosening the fastenings of the bracket. The propeller is bolted to a flange at the end of a 1-in. shaft, supported on the bracket by two bronze bearings.

The engine is laid on a bed made of angle iron, and provided with steel brackets to accommodate the particular shape of the engine used. The brackets are provided with an up-and-down adjustment which raises or lowers the engine to take up slack in the chain. The driving sprocket on the rear wheel of the motorcycle is removed and bolted to a flange at the rear end of the propeller shaft, being kept in line with the sprocket on the engine. The chain is then applied, giving a speed ratio of about 1½ to 1.

A gas tank is hung above the engine, being supported by a brace bolted to the propeller bracket at one end and to the spring bracket at the other. The oil tank is kept within reach of the driver, so that he may pump oil into the crank case while in motion. The throttle on the carburetor is controlled by a steel wire, brought through the steering shaft and fastened to a lever on the steering wheel. The advance lever on the magneto may be controlled the same way, if desired.




The Frame is Made of Band Iron, Bolted Directly to Strips of Wood, Which Give Stiffness. It is Held Together by Wires with Turnbuckles

A propeller guard, made of sheet steel reinforced by rolling the edges about a steel rod, is mounted at the front. It is bolted to the frame and braced to the propeller bracket.

The seats are made of galvanized iron, having a wooden base upholstered with imitation leather. The driver's seat is

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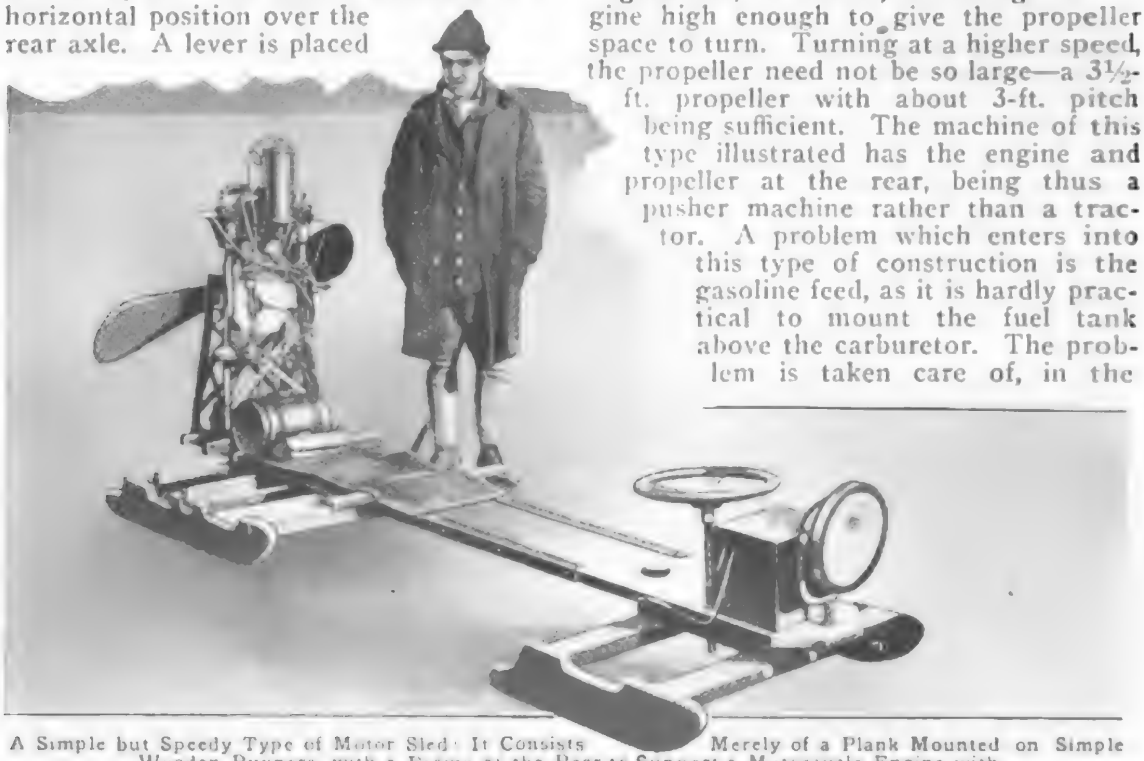
tilted back and hung between the frame members; the rear seat is fastened in a horizontal position over the rear axle. A lever is placed within reach of the driver's foot, connected by a steel cable to a drag hook hung under the rear axle, which acts as a brake when required. A headlight is attached to the front of the frame, operated by a storage battery, which may be mounted whenever night driving is contemplated.



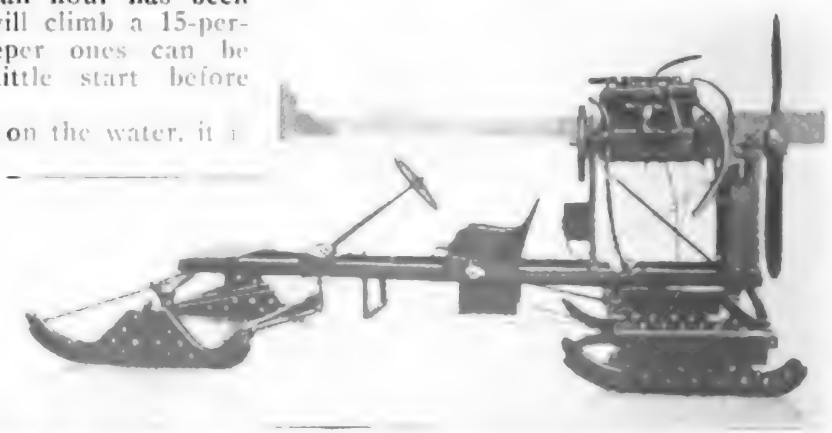
A Simple but Speedy Type of Motor Sled: It Consists Merely of a Plank Mounted on Simple Wooden Runners, with a Frame at the Rear to Support a Motorcycle Engine with Propeller Directly Attached

The engine is started by turning the propeller in the same manner as an airplane engine. With an ordinary twin motorcycle engine turning at 2,400 r.p.m., a speed of 55 miles an hour has been obtained. The sled will climb a 15-per-cent grade, and steeper ones can be negotiated with a little start before climbing.

To use the machine on the water, it is only necessary to remove the runners and replace them with pontoons, which can readily be made by covering a light but substantial wooden frame with sheet metal.

A somewhat simpler type of machine can be made by mounting the propeller directly on the crankshaft of the engine and, of course, mounting the engine high enough to give the propeller space to turn. Turning at a higher speed, the propeller need not be so large—a 3½-ft. propeller with about 3-ft. pitch being sufficient. The machine of this type illustrated has the engine and propeller at the rear, being thus a pusher machine rather than a tractor. A problem which enters into this type of construction is the gasoline feed, as it is hardly practical to mount the fuel tank above the carburetor. The problem is taken care of, in the machine illustrated, by the use of a vacuum-feed system. A speed of 50 miles an hour on smooth ice is claimed for this sled.

A machine somewhat similar in type, but heavier and more powerful, is shown in the last photograph. It shares with the preceding one the features of direct drive from the engine to the propeller and of consequent freedom from transmission difficulties. It also, to some ex-



A Heavier Type of Sled: Driven by a Water-Cooled Engine Taken from a Light Automobile, It Avoids the Use of a Chain Drive, but Has the Disadvantage of a Heavy Engine Placed High in the Air

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tent, has the disadvantage of being rather top-heavy, and this must be taken care of by placing the runners far apart and avoiding the turning of very sharp curves. The automobile engine used is an ordinary water-cooled one, of about 25 hp. It is mounted on a skeleton frame with the radiator below the crankshaft, just ahead of the propeller. Thus the propeller, in drawing back the air, forces it directly through the radiator, giving quite effective cooling. The frame is mounted on elliptical automobile springs. On this sled, the runners are made easily demountable, and two sets are provided, flat ones for use on the snow and a beveled set for ice running.

As to which of these types is to be preferred by the amateur mechanic who wishes to build a motor sled, this depends largely on what kind of an engine he can get hold of; whether he gives first importance to safety of operation or to ease of construction, and other questions of this nature. The first sled described possesses the great advantage of lower distribution of weight—an engineering feature which contributes to safety from accidents. The propeller guard is another great safety feature. The second sled is perhaps the simplest type in construction, but the engine will need to be well-braced, or something will be sure to rattle loose. If a larger water-cooled engine is available, and it is not easy to procure a suitable chain drive, the type of construction in the last photograph may be almost inevitable. If the tread or the distance between the runners is then made great enough to counteract the top-heaviness, and if the runner construction is made strong enough to take care of this extra width, there is no reason why the sled should not be safe.

### To Preserve Shoe Soles

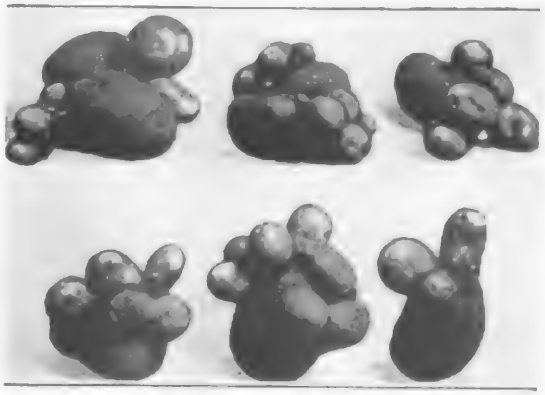
An old method of preserving leather may be useful in these days when shoes wear out so rapidly. A thin varnish is applied to the leather—two coats with a short interval between them, and a third one after these have thoroughly dried. If this is done every two weeks to the soles of shoes, their wearing qualities will be much improved and a saving effected while high prices prevail.

### Old Tires Prevent Rattle in Car

Whenever an automobile is overhauled periodically—whether once a year or oftener—a very economical method of reducing vibration in the chassis, engine, and body, consists in placing gaskets of rubber between the bolted surfaces, the gaskets being cut from sections of old tires. The elasticity of the rubber remains effective for about a year; but, to get the full benefit of the cushioning effect, the gaskets should be renewed every time the car is overhauled. Among the places where they are of service may be mentioned the spring seats on the axles, where two thicknesses of rubber should be placed, if the car is a heavy one. This prevents road shocks from being transmitted directly to the frame. Similar pieces should be placed below the engine lugs, before these are bolted to the frame, so that the rubber will deaden the hammering of the explosions. Gaskets should also be placed under the transmission lugs, to diminish the vibration caused by bringing the gears into mesh. Other places to use the rubber gaskets are the supporting arms of the radiator, and the ledges of the body and engine hood.

### Winter Crop from Old Potatoes

Old potatoes that are left at the end of the summer may be used to raise an indoor crop, no matter how shriveled they may be. Place them in a little dry soil in a dark cupboard, or cellar, and leave them. In a few weeks they will start to sprout, and the small potatoes can be gathered when they are about as large as walnuts. The old potatoes will go on bearing through the greater part of the winter, until there is nothing left of them but dry skins.



Old Tubers Which are Left at the End of a Season can be Used in a Peculiar Form of Indoor Potato Culture

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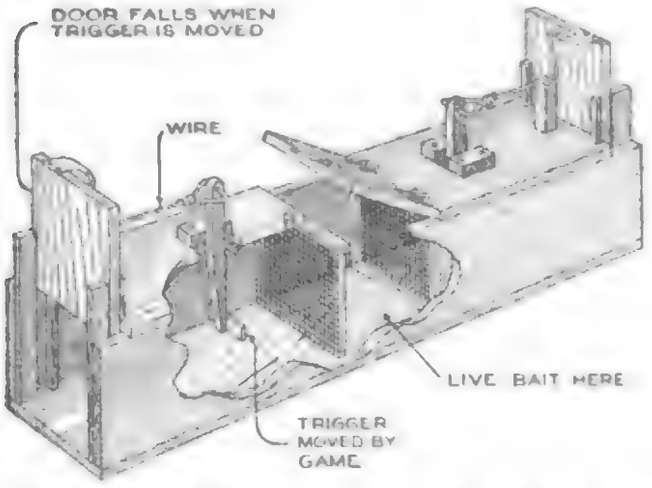
### Sounding Board for Electric Bell

If an electric bell is mounted on an old cigar box, with an S-shaped slot, about ¼ in. wide and 3 in. long, cut at each side, the loudness of the sound will be greatly increased. The box acts as a sounding board, and thus enables a small bell to be heard all over a moderate-sized shop or warehouse.—H. A. Barwick, Shawinigan Falls, Quebec.

### Trapping with Live Bait

An animal that would otherwise pass by a trap, will stop to investigate the




**A Live Chicken is Used as Bait in This Trap, but is Protected by Wire Netting from Attack by the Animal When Trapped**

scent of a live chicken, or other live food that suits its taste. Skunk, opossum, and even the wary mink, may be caught in this way. The trap should be made double, with a cage for the chicken in the center. Take four boards, about 8 in. wide and 4 ft. long, and nail them together in the form of a long box open at both ends. Before the top board is nailed on, however, put in two partitions of strong, close-meshed wire netting to form a cage for the chicken. Also saw out and hinge a short piece of the top board to make a door through which the fowl can be put in and taken out. Doors in either end of the box slide up and down between cleats nailed to the sides, and are held open by a simple trigger.

The fact that the prowling animal can glimpse daylight through the box leads it to venture in without suspecting a trap. Once inside, it is sure to touch the trigger, which releases the door and lets it drop down, closing the entrance. There is no reason why another animal may not enter through the other door, making a double catch. The chicken will be perfectly safe, as the animal cannot enter its cage. Furthermore, an animal will usually lose all appetite for the bait when it finds that it has been trapped.

The nature of the catch can be determined by looking through the hole in the top of the box. Unless it is desired to take the animal alive, it can be drowned by holding the trap under water. This should always be done with a skunk. The trap will prove more effective if a little light brush is spread on top of it. The doors should be arranged to close securely, and, if necessary, weighted. A strip of tin, tacked along the lower edge, will prevent the animal from gnawing out.

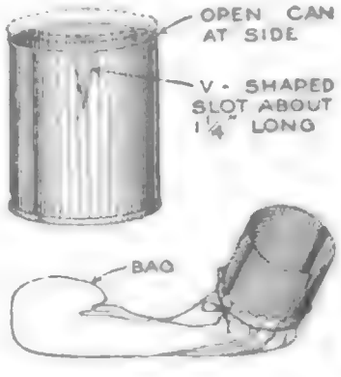
A somewhat similar form of box trap has no cage, but is divided in the center by a screen of wire netting. This trap is baited with apple, cabbage, or turnip, and will likely catch a rabbit. Should a mink or a skunk come along, it will probably try to get at the rabbit from the other side of the wire screen, and be caught in the other end of the trap. A set of this kind will be more apt to get a mink if the rabbit is left in the trap over the second night.

### Rubber Bands Help Glue to Bind

When an article of furniture is being glued, the permanence of the job does not depend entirely on the quality of the glue. Attention should also be given to the method of holding the glued parts together until the glue dries. Wherever it is possible, use strong rubber bands. The tension is steady, and they can be used over again many times.

### Can for Gathering Clover Seed

Gathering sweet-clover seed by hand is a tedious task, even when the patch of land is quite small. To save time, use an ordinary fruit can, with a slot cut in the side, as shown—and if a large quantity of seed is needed, cut a large hole in the bottom of the can, and attach a bag to catch the seed as it falls through. When using it, catch the stalk in the slot, with the head inside the can, and pull outward. The edge of the slot will detach the seed, which will fall into the can.

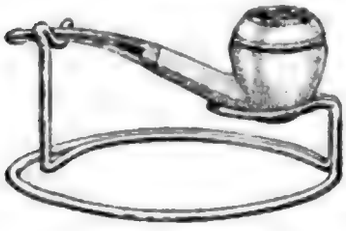


### Tool Case from Tire Tube

A handy pouch for small emergency tools can be made from a 12-in. section of an old automobile inner tube, and can be carried in the door pocket of the car. At one end of the piece of tube, cut away sufficient rubber to leave a corresponding flap, about 1½ in. long. Fold the flap over, and cement it, so as to close the entrance to the tube at that end, forming the bottom of the pouch. Then make a similar flap at the other end, about 3 in. long, to form a cover, which may be secured by a button stitched to the rubber. To keep the tools from striking together, separate compartments can be made by making vertical stitches, which hold the front and back together between the compartments.—Y. K. Stoddard, San Diego, Calif.

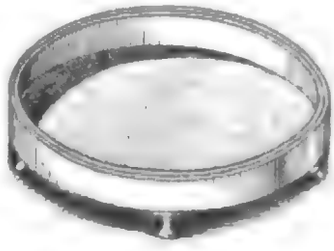
### Stand for Tobacco Pipe

A convenient stand, or rack, for holding the smoker's pipe in an upright position when not in use, can be made by bending a single piece of wire to the shape illustrated. Stiff steel or hard-brass wire should be used, and the shape should be patterned so as to bring the weight of the pipe well inside the circular base. The rack can be nickelplated at small expense, if desired for permanent use.—Wayne W. Leyrer, Atlantic City, N. J.



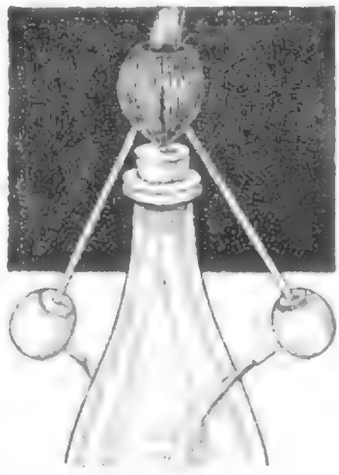
### Tray Made from Embroidery Hoop

With a few glass push pins, an embroidery hoop, and a piece of leather, silk, or other material, an ornamental tray can be made, suitable for use on a dressing table. The material is stretched over the outer hoop, and gripped by the inner hoop in the usual way, but before placing it in position it should be carefully cut to such a size that no part of the edge will be visible when the inner hoop has been adjusted. Then thrust the push pins between the hoops, to serve as legs for the tray, and, if desired, add a little painted decoration.



### A Curious Water Mill or Turbine

The toy mill here shown is operated by reaction of streams of water. The only materials necessary are some wheat stalks, a corked bottle, two hazelnuts, and a walnut with a sharp point at one end. Break the walnut open at the end remote from the point, remove the kernel, and bore a hole in each side to admit the ends of two pieces of wheat stalk, about 4½ in. long. Then bore two holes in each of the hazelnuts, one at the top and one at the side. Remove as much of the kernel as possible from the interior of each nut by thrusting a needle, or a piece of wire, through the holes and scraping the nut on the inside. When they have been fairly well hollowed out, fit them onto the ends of the long straws, and put straws, about ½ in. long, into the holes at the sides. Then place the point of the walnut on the cork, balancing it so that the long straws hang down on each side of the bottle, with the short straws pointing in opposite directions.



To operate the mill, pour a steady stream of water into the walnut. The water will run down through the long straws into the hazelnuts, and out through the short straws; and the two outflowing jets of water will cause the apparatus to revolve rapidly as long as the stream continues to flow.

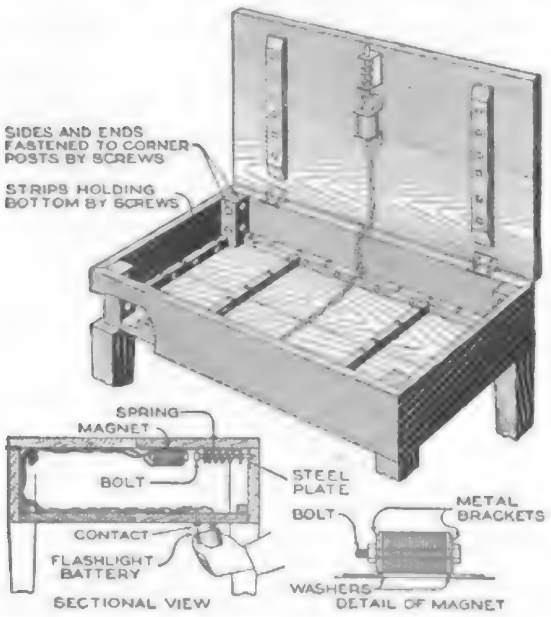
### To Protect Unexposed Photo Plates

When opening a box of camera plates, cut the outer one in two at the center of the longest dimension, instead of cutting the paper and opening it as usual. This leaves the outer box somewhat like a playing-card box, the two halves slipping over the ends of the inner box. The plates will thus be prevented from being accidentally exposed, which may occur if the inner box drops out when lifting off the cover of an ordinary outer box.—A. Handelman, Montreal, Canada.

¶When trouble is encountered in putting on a tight belt, try a piece of sandpaper between the belt and the pulley.

## Flash-Light Battery Forms Key to Electromagnetic Lock

Most people have use for a place to store articles where they will not be disturbed by unauthorized persons. Any ordinary cabinet requiring a lock and key will, of course, do, but the table-top




**The Table Has a Hollow Compartment Which Is Quite Inaccessible Except by Applying a Small Electric Battery as a Key**

cabinet, opened by electricity, is novel as well as practical, and safer.

The cabinet itself is part of the table. But it should be built so that there are no screws or nails that may be drawn to open the box. The drawing shows how such a cabinet is put together. The legs of the table serve as corner posts. The sideboards are screwed to these posts, but the screws should be started from the inside, leaving no heads showing on the outside of the cabinet. The bottom is fastened to strips screwed to the sides, all screws being started from the inside, as before. The top is made up of several pieces, fastened together by cleats on the underside. It should be hinged on the inside, as shown.

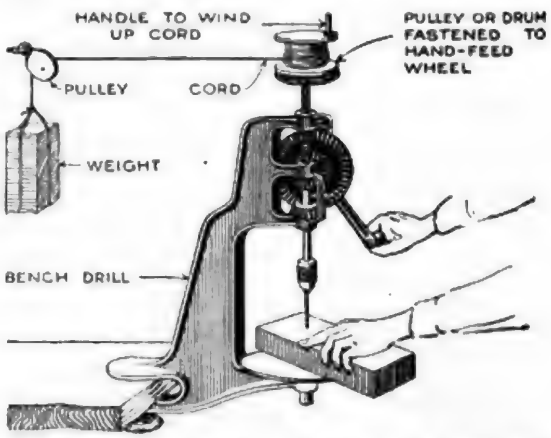
Means of locking and unlocking the cabinet are provided by a magnetic latch. Between the ends of the bracket, the bolt is surrounded by a light coil spring, one end of which is run through a hole drilled in the bolt. The head of the bolt, at the other end of the bracket, forms the armature of an electromagnet. This magnet, consisting of six layers of No. 24 magnet wire, wound on a 1½-in. bolt or machine screw, serves to unlock the cabinet. The wires making connection with the magnet are led to the bottom of the box, and are there soldered to two pins, or fine nails, which are driven into the bottom of the box, and thus out of sight. Where the wires cross the hinged edge of the top, they should be left loose, with a little wire in a free loop, so that they cannot be damaged by opening the lid. Insulated staples may be used to hold the wire to the wood.

The cabinet may be finished as desired, but care should be taken to remove the finish from the pin or nail heads on the bottom of the box, so that they will make good connection.

To unlock the cabinet, hold the spring contacts of a flash-light battery against the pin or nail heads, as shown in the drawing. This furnishes current to the magnet, which pulls back the bolt, thus allowing the lid to be raised. If it is desired to make a spring lock, proper shaping of the steel plate into which the bolt fits will accomplish this result.—J. Horace Van Nice, Waukon, Ia.

## Workman Uses Bench Drill Fed by Hanging Weight

The advantage of the drill here shown is that it is fed by means of a weight, so that the operator's hands are free to hold the work and turn the crank. It can be stopped at any point by giving the cord a couple of turns around the chain, or hook, which holds the pulley. By changing the weight, the power applied to the feed can be varied, and drill sizes from ⅛ in. to ½ in. have been used with complete success.—Wesley S. Malloy, Whitefish, Mont.




**A Hanging Weight Feeds a Bench Drill, So That the Operator may Insure Accuracy by Holding His Work with One Hand**

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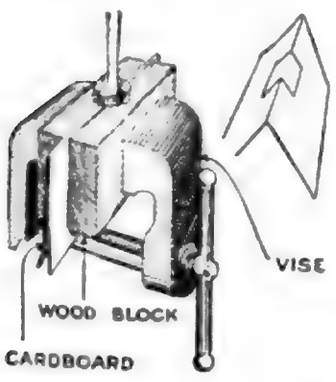
### Sun's Heat Runs Steam Engine

In the course of a series of experiments made to demonstrate the effect of lenses in concentrating solar heat, three lenses collected sufficient heat to drive a small steam engine. They were arranged at equal intervals around the vertical cylindrical boiler. As the heat from the sun could pass directly through only one of them to reach the boiler, it was reflected through the other two by mirrors. It was necessary, of course, to place each of the mirrors at a certain angle to the path of the heat waves from the sun, so that they would be reflected through the lenses, and to adjust each lens in such a way that the heat passing through it would reach a focus on the boiler. The three focal points were thus arranged at equal intervals, to insure uniform heating of the water. In this experiment, sufficient power to run the engine was obtained in six minutes; but the number of mirrors can be multiplied indefinitely, as long as there is room to set them up without obstructing the light, so that the time taken to boil the water may be considerably reduced.—Philip A. Wall, Bedford, Mass.

### Square Hole Made with Round Bit

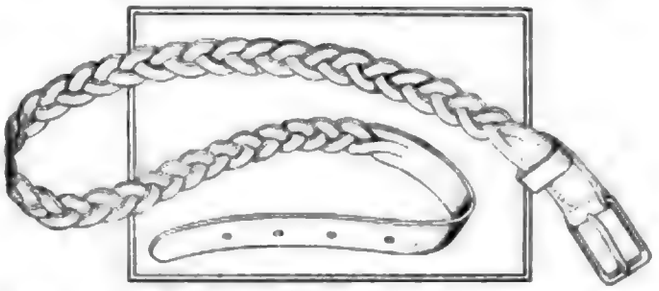
One may safely wager that he can bore a square hole with a round bit, provided the material to be bored is left out of the agreement. The illustration shows how the trick is done. Fold a piece of paper, or cardboard, and clamp it between two blocks of wood in a vise. The bit should be one of the type used for making blind holes with flat bottoms in wood—an auger without the guide screw, or a twist drill ground nearly straight across. Bore down a distance equal to half the diameter of the bit; when the cardboard is removed, it will have in it a square hole made by a round bit.—Edw. H. Davis, Philadelphia, Pennsylvania.




¶ The price of a razor strop can be saved by using a piece of newspaper folded to a width of 2 in. The porous surface offers sufficient resistance to the blade, and the printer's ink acts as a lubricant.

### Braided Leather Belt

By proceeding as follows, it is not difficult to braid an ordinary leather belt without cutting the strands apart at either end:

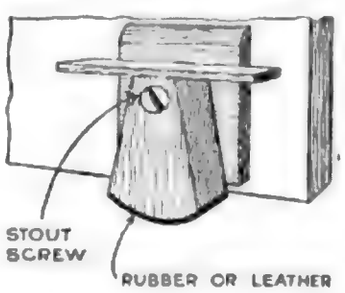


The Braiding of the Belt may Look Impossible, but It is Easily Accomplished as Described

Cut the central part of the belt into three strands of equal width, beginning a few inches from the buckle, and ending the same distance from the last hole. Fasten the buckle to a hook, and begin braiding the strands. After about 6 in. has been braided, it will be necessary to untangle the free end of the belt. This is done by holding the braided part of the belt in the left hand, while the right hand passes the free end through the cuts. The belt should be braided very tightly. The last time the free end is untangled, it will be impossible to do any more braiding. Then loosen the strands, allowing them to take up the portion remaining unbraided. The edges may be colored with shoe polish, if desired.—Tod Masters, Fort Atkinson, Wis.

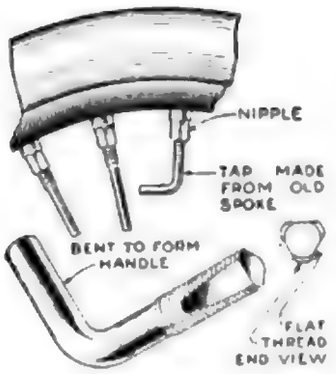
### A Simple Doorstop

A doorstop which is easy to make, and which will hold the door in any position, even if the floor is somewhat uneven, consists of two or three blocks of wood fastened by a few small nails and one large screw. The curved surface at the bottom is made eccentric, so that, as the block is rotated by the foot around the screw as a pivot, it will bind against the floor, or be released from it, depending upon the direction in which it is rotated. The large block, attached to the door, serves merely to give a longer bearing to the screw, which is essential, as the strain upon it when in use may be considerable.



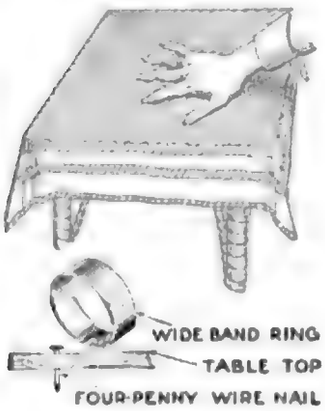
### Nipple Tap Made from Old Spoke

When replacing a broken wire spoke in an automobile wheel, it is sometimes difficult to screw the new spoke into the nipple, owing to rust and accumulated dirt; and if force is used, another broken spoke may result, or a damaged nipple, which means removal of the tire while a new nipple is being screwed in. This trouble can be avoided by making a tap out of an old spoke, provided the threads are still fairly good. File three flats on the threaded portion, an equal distance apart, as shown in the sketch, and cut off part of the spoke to form a handy tool, after bending the end to make a handle. This will make an excellent cleaning tap, and can be used several times before it becomes dull.—D. Welge, Mason, Nev.




### A Simple "Spirit" Table Levitation

Spirit effects always create interest and mystery. A simple table-lifting effect can be produced at home with little preparation. A small, light stand will be required, a wicker flower stand being suitable. Drive a four-penny wire nail into the center of the top, so the under part of the nail head has about 3/16 in. clearance above the table. Touch a little black paint to the part of the nail above the table top. A woven-wool or tapestry cover should then be thrown over the top. Get a wire band ring; a "gold-filled wedding-ring" can be bought for 10 or 15 cents. File a notch in this, so the head of the four-penny nail will hook into it. Put the ring on the "ring finger" with the notch underneath.

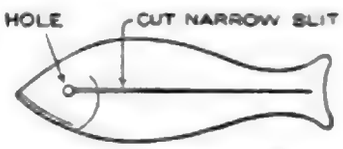



The operation of the trick is as follows: Rub the hands over the surface of the stand to "magnetize" it. Under cover of these motions, work the nail head through the strands of the stand cover. Then hook the nail head into the notch of the ring. Spread the fingers out, and continue motions with the other hand to add mystery. Then take away the free hand and lift the stand slowly. Act slowly, as though uncertain of the "magnetism"; it will divert attention from thoughts of mechanical aid. After lifting the stand, let it down slowly. Then "demagnetize" it. This gives opportunity to pull the cover over the nail again, although it will not show if the audience is a few feet away. Do not let the spectators see the palm of the hand that wears the ring, or they will discover the notch.

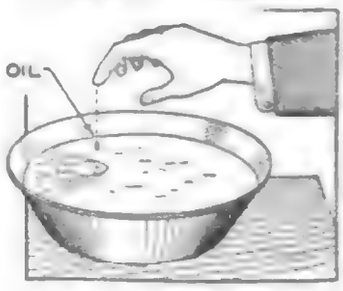
A heavier table can be lifted by having a ring for each hand and two nails spaced properly on the table, although the one-handed table lifting is just as effective.

### The Trained Pasteboard Fish

The swimming fish is a pretty trick to perform for a small company. Cut, out of cardboard, a fish about 2 in. long, and make a hole, about the size of a small drop of water, where the eye of the fish would be. Cut a very narrow slit from this hole to the middle of the fish's tail. The fish should be of orange, or some other bright color, so as to show plainly in the water. The trick is done as follows:




FISH 2" LONG CUT FROM A PIECE OF CARDBOARD




A large shallow pan of water is placed on a low box; the fish is put into the water so that its tail nearly touches one end of the pan; the performer then announces that when he beckons, it will swim toward him. He holds his hand over the fish an instant, then stands back and beckons to it, using some nonsensical formula when doing this.

The secret of the trick is that, unknown to the spectators, the magician lets a drop of oil fall from his finger into the hole in the fish's head; and, in spreading over the water, the oil forces itself out through the narrow slit and pushes the fish along.

If observers see the drop of oil fall, they will probably think it only a drop of water, especially if the performer waves his hand about a little when putting the fish into the pan.

### Chewing Gum as Repair Cement

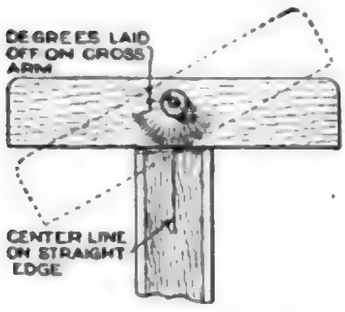
A motorist had trouble with the control lever of his car, the knob of which had worn loose. The threads inside the composition ball had become stripped, and on rough roads it was sometimes shaken off the lever. To tighten it, a wad of chewing gum was thrust into the hole in the ball, after which it was screwed on to the lever, and made a tight fit when the gum had hardened.—Frank W. Roth, Joplin, Mo.

### Newspaper Rack under Mail Box

Mail boxes, such as those used at the entrances of apartment houses, are usually not large enough to accommodate packages. A convenient and not unsightly addition to a row of these boxes is a rail made of ¼-in. round brass, or plated steel, running below the boxes, about 1 in. from the wall, with the ends bent in and fastened to the wall. Such a rod forms a convenient receptacle for many small packages which may come through the mail.

### A Bevel Protractor on a T-Square

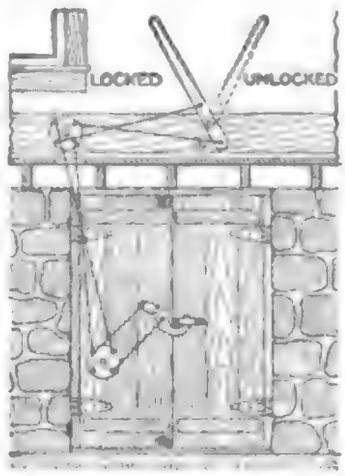
An ordinary wooden T-square can be used also as a bevel protractor, in the manner illustrated. First, remove the cross arm and attach it to the straightedge with a bolt and spring washer. Mark off the degrees of a semicircle upon the cross arm as shown, and make a mark on the straightedge opposite the zero mark on the cross arm. Preferably, the graduations on the latter should be numbered up to 45 or 60° on each side of the central, or zero mark. This treatment of a T-square is advisable only for certain classes of work, as it will usually be found to diminish somewhat the accuracy of the square for ordinary use. For certain classes of drafting, however, the combined protractor and T-square will be sufficiently rigid, and will prove a very useful instrument.—L. B. Robbins, Harwich, Mass.




¶To prevent blowholes when pouring babbitt, drop a small piece of rosin into the ladle just before it is ready to pour.

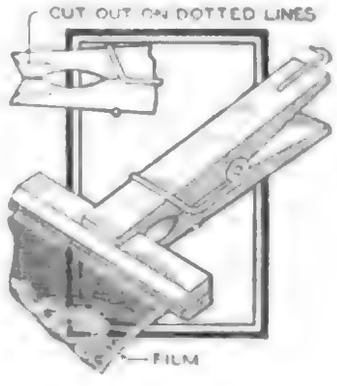
### Bolting an Outside Cellar Door

Because convenient means of locking it are not usually provided, an outside cellar door sometimes offers a thief an easy entrance to a house. The illustration shows in diagrammatic form how a cellar door can be strongly latched by working a lever on the floor above. All the connections should be of good, strong steel wire, securely twisted at the ends. The wire, attached as shown to the pivoted disks, forms a light and strong substitute for a complicated linkage. The principal point to be taken care of in arranging the wires is that the lower disk must be placed as close as possible to the hinge line, so that, when the door is opened or closed, the wires will not be stretched.—P. G. Bernholz, East Orange, N. J.



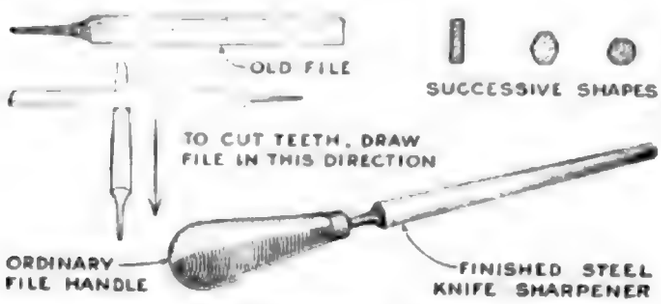

### Clip for Drying Films

When a length of photographic film is hung up to dry after washing, it can be prevented from curling by attaching a specially made clip to the lower end, another similar clip being used to support it above. To make the clip, cut out a piece from the nose of a spring clothespin as shown in the sketch, making the cut about ⅛ in. deep. In the cavity formed in each of the two members of the clothespin, glue a piece of cigar-box wood, ½ in. wide and 3 in. long. Thrust a short piece of wire into a hole bored in the other end of the clothespin, and bend it into the form of a hook, so that the clip may be hung on a nail. The clip supports the film, while another one at the lower end keeps it from curling. If the weight of the lower clip is not sufficient for the purpose, a small piece of metal can be attached to the hook.—A. Gerish, New York, N. Y.



### A Steel Knife Sharpener

A steel knife sharpener, such as the butchers use, may be easily made at home from an old file, all the tools required being an old iron plate to hammer on, a




**An Old File Forms Excellent Raw Material for a Knife Steel, Which is Made by a Little Forge Work**

hammer, a file, and a coal fire—one in the kitchen stove will do.

The file is heated to a bright cherry-red color, and hammered into the round shape illustrated. First, hammer on the edges, to upset the metal. It will be seen to work through the successive shapes shown in section. After it has been given a nearly round shape, and has a diameter of about $\frac{5}{8}$ or $\frac{3}{4}$ in. at the large end and $\frac{3}{8}$ in. at the small end, the process of rounding and finishing takes place. To do this, work with the steel at a dull cherry-red heat; starting at the large end, roll the steel on the plate, hammering around the entire circumference to remove the rough corners and make it as round and smooth as possible. Gradually work toward the small end, forming the taper while progressing. The steel will now probably be too long. The extra length is removed by nicking all around with a file, and breaking off the end. Hammer this end round, and the forging is complete.

Now heat the piece again to a cherry red, and allow to cool without quenching it, thus leaving it soft. When cold, the fine teeth must be put in. To do this, hold the steel tightly in a vise, or on the bench between nails. Use a sharp, coarse file, and hold it as shown in the picture, at right angles to the steel. Draw it from the small end to the large end, pressing firmly so as to cut the teeth as deep as possible. Proceed thus, drawing the file in only one direction, clear around the steel. Feel if the entire surface is well covered with these small scratches. If not, touch up any spot where they are lacking.

The steel must then be hardened, which is best accomplished, at home, in the following manner, as care has to be taken to keep the edges of the fine teeth from being burnt off: Mix a small handful of salt and a similar amount of wheat flour together, adding enough water to form a thick paste. The steel should be clean and dry; then coat it with the paste, so as to cover all the teeth well. Heat to a bright cherry red for the entire length, and plunge into water. When plunging the piece, hold it in a vertical position, which will prevent warping.

An ordinary file handle, fitted to the tang of the steel, finishes the job. A steel well made in this manner is equal to any that can be bought in the market.—S. B. Royal, Baltimore, Md.

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### A Homemade Postal Scale

This postal scale is easily made, and may give quite accurate results, as it does not depend on a spring, and there are no weights to be lost. The letter is placed on a wire rack, which hangs from a hook made of similar wire. The latter is fixed in the upper end of a swinging pendulum, to which a scale arm is attached, and which is weighted, if necessary, by boring deep holes in the lower part of the curved edge, and nearly filling them with shot, gluing in blocks to hold the shot and close the hole.

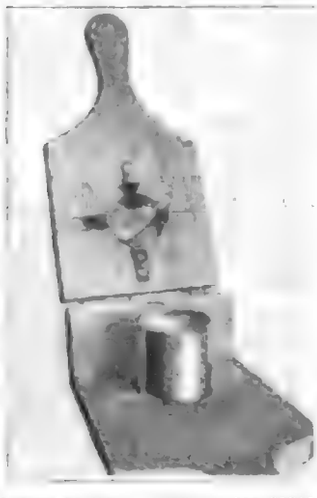
To make the graduations, first make a vertical mark on the standard just above the scale arm, and coinciding with the straight edge of the wide curved piece. This will then be the zero mark of the scale. Now, hang a 1-oz. weight by a fine thread from the letter rack, and make a mark on the scale arm at the point just in front of the line made on the standard. Similarly, hang a 2-oz. weight from the rack, and make a mark for two ounces on the scale arm. This can be continued to the end of the scale arm, or until the weights shown run as high as will be needed. The spaces between the marks for the higher weights will be less than those between the lower figures, a peculiar advantage of this scale.

If no correct ounce weights are at hand, the marks can be found very nicely by using, instead of the 1-oz. weight, a new silver dollar, or, preferably, two new half-dollars and a one-cent piece, which will have a combined weight of one ounce, with an error of less than one per cent. The three coins are hung by a thread from the letter rack, and a line is made for the 1-oz. mark, which will be the most frequently used. For the 2-oz. mark, hang in a similar fashion two silver dollars, or four half-dollars and two one-cent pieces, if accuracy is desired. For other marks, similar combinations of coins can be used.

The dimensions of various parts of the scale may be gauged roughly from the photograph by comparison with the letter on the rack. None of these dimensions need be accurate or particular, since the marks on the scale are found entirely by experiment.—Charles A. King, Plymouth, New Hampshire.

## Easy-Operating Can Opener

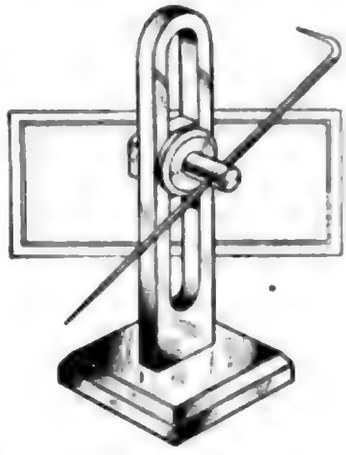
An officer in France introduced a can opener on the American front which did its share in simplifying the work of handling commissariat stores. He had observed the muscular effort that was necessary when a woman canteen worker was compelled to use a dull opener, which was often the only one to be found. It required all her strength to make the blade cut the tin, and the number of cans to be opened was almost beyond calculation. The remedy was the opener with the heavy wooden frame shown in the photograph. Metal clamps hold the can, while the blade is forced into its top by pressure on the handle of the upper member of the frame. The blade is fixed to a metal arm which is pivoted to the frame at a point corresponding to the center of the can, and is turned by a crank on the top of the frame. One revolution cuts out the entire top of the can, which is then lifted out without leaving dangerous jagged edges. This can opener reduces exertion to a minimum.



PHOTO, COURTESY AMERICAN RED CROSS

## An Inexpensive Surface Gauge

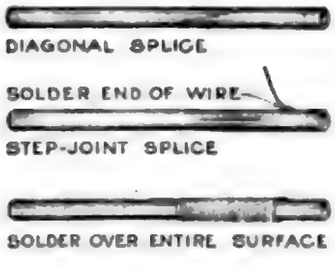
The little surface gauge shown in the diagram should prove attractive to the metal worker who is unable to make a large expenditure for tools. With the aid of this instrument, and a piece of plate glass as a surface plate, quite accurate layouts can be made.



The base of the instrument is merely a block of steel or cast iron. The standard is held to this by means of two small machine screws, which pass through the base from the bottom. To make the long slot in the standard, a series of holes are first drilled in it. After this is done, the superfluous metal is filed out. The scriber is held in a small stud with a threaded end which protrudes through the slot. A knurled nut is put on the stud first, and a square nut or washer, with a protruding section which slides in the slot to prevent it from turning, is fitted and soldered to the far end of the stud, after inserting it in the slotted standard.

## Splicing Thin Tubing

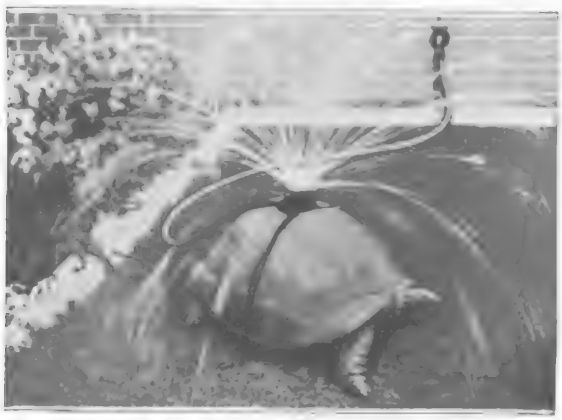
The splicing of copper or brass tubing is not difficult when a piece of tube is at hand of the correct diameter to slip over the outside. Without such a tube, however, the job can be done with a piece of copper wire in the manner illustrated.




Cut the pipe ends diagonally, or else make a step joint. Tin the faces that butt together. Attach one end of the wire to the pipe with a drop of solder, and wind the wire around the junction so as to cover it completely. Then wet the joint and the wire all over with soldering acid; hold the joint in a flame until it is hot enough to melt the solder; apply sufficient solder to hold the wire tightly, and form it into a solid covering. The junction made in this way may be stronger than the tube itself, because of the extra thickness of metal.

### TURTLE CARRIES SPRINKLER ON FIRE-STATION LAWN

Man has found useful work for the slow-moving turtle. On the lawn of a fire-department station in a California town, a giant of the species is efficiently serving as an animated sprinkler, simply by roaming



**Slowness Makes This Enormous Turtle Efficient at Its Task, That of Carrying a Sprinkler over a Fire-Station Lawn**

over the grass with a spraying nozzle strapped to its back. The hose which connects the nozzle to a hydrant acts as a leash to keep the shell-covered creature from wandering away from its task. Practically all of the lawn is watered during the course of a day.

### PRIZES OFFERED FOR ESSAYS ON ARTILLERY SUBJECTS

Two cash prizes, the first $150 and the second $100, are offered for essays on coast-artillery or heavy-artillery subjects, by the Journal of U. S. Artillery. No limiting length is specified, but the copy must be typewritten, double-spaced, and sent in triplicate. If illustrated, original photographs, drawings, or tracings must constitute one of the three copies. The manuscript is to be signed with a nom de plume only, and be accompanied by a sealed envelope identifying the nom de plume with the author's name. Essays, to be eligible in the competition, must be in the hands of the editors on or before Dec. 31, 1919, in an envelope marked "Essay Competition." The committee of award will be appointed by the Coast Artillery Training Center Staff, and all essays become the property of the journal.

### CLUB OFFERS LARGE PRIZE FOR DESCRIPTIVE NAME

For the name which will best describe all of the English-speaking countries of the world, a prize of $1,000 has been offered by the World Trade Club of San Francisco, an organization which is carrying on a campaign for the adoption of the metric system of weights and measurements in the United States and the British Empire. Some of the names already suggested include "Sam-Bull," "Ambria," and "Ambritica." The money will be paid May 15, 1920.

¶Sunrise and sunset hours change so little in the Canal Zone that the daylight-saving law never went into effect there. In the summer the sun rises at about 6:00, and sets at 6:40; in the winter it rises at 6:35 and sets at 5:50.

## BRIDGE RULES IN RIME

By CHARLES H. WRIGHT

**"Jingle rules" are usually the easiest remembered and therefore the most useful. The author, having recently mastered the game of bridge, wrote the following verses for his own use. Others tried them and praised the idea; therefore we print them for the assistance of our readers.—Editor.**

In bidding, do remember this:
Don't fib, whate'er you do.
Your partner cannot see your cards,
So tell him what is true.

**The Original Bid**

With one trick sure, five in that suit,
Should bidding with you start,
And in a side suit one more trick,
You bid a spade or heart.

Don't bid one diamond or one club,
'Less two such tricks in sight;
And other guarded strength you need,
For no-trumps you invite.

Bid no-trump without doubt or fear
With three suits guarded well;
But be alert for trouble sure
Which other bids foretell.

**The Second Bid**

With three strong suits, should dealer bid
Your weak one, then you "double."
To double no-trumps, have a care;
You may be courting trouble.

**The Third Bid**

Don't help your partner in his bid
Unless your suit is strong.
His club or diamond one take off;
To fail in this is wrong.

**The Fourth Bid**

If partner doubles one in suit—
No-trump is quite the same—
To leave him in courts instant death.
You'd better quit the game.

Unless one's sure to make the game,
Fourth hand won't make first bid.
Best let your partner deal new cards
And of these hands be rid.

**The Lead**

The choice of suit depends somewhat
On bidding gone before;
But independent leads should be
From suits not less than four.

A king lead says, "I've queen or ace."
Ace, king, led says, "No more."
The queen or jack tops sequence sure
Of two or three or four.

The nine lead is of nothing top.
Deuce says, "This suit is weak."
In fact, a three or four spot led
Claims little, so to speak.

The leads of fourth best of a suit
In many ways apply.
They show your partner without fail
Where winning cards may lie.

Now, when you play, don't e'er forget,
Watch all the cards that fall.
They have a meaning every one;
They have a meaning all.

**IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]**

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# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 32 DECEMBER, 1919 No. 6

## Truck with Elevator Body Loads Ice Cars

MOTOR trucks that rise up in front and spill their contents out the rear are common sights, though they never lose their novelty to the passers-by. Useful as this contrivance has proved, however, it is helpless before the task of dumping ice into the top of a refrigerator car. This work, indeed, is usually done by hand, slowly and laboriously. Now a concern in Pittsburgh, impatient of this primitive method, has devised and is using a body for a three-ton truck that becomes an elevator when it is drawn up beside a switch track, and hoists its whole cargo at once to the roof line of the waiting car. The body, hung in a framework cage like any good elevator, is pushed up bodily by four vertical screw shafts, one with a right and one with a left-hand thread at each end. The truck engine revolves these elevating rods under the driver's control. The blocks of ice are simply slid out of a side door in the body into the roof door of the car, an expeditious and economical performance.

The principle of the hydraulic elevator also has been applied to motor trucks for loading ice into refrigerator cars, in the same city where originated the model just described. Oil is used instead of water to work the lifting pistons. In this case the elevator, instead of comprising the whole truck body, is simply an attachment in the shape of a small platform back of the driver's seat, holding two 400-lb. cakes of ice. The elevator attachment weighs about 380 lb. and it empties the 9,000-lb. truck in from 10 to 15 trips.

**Motor Truck with Elevator Body, for Loading Ice into the Top of a 'Refrigerator Car: The Body is Hoisted by Revolving Four Vertical Screw Shafts, Using the Engine of the Truck**



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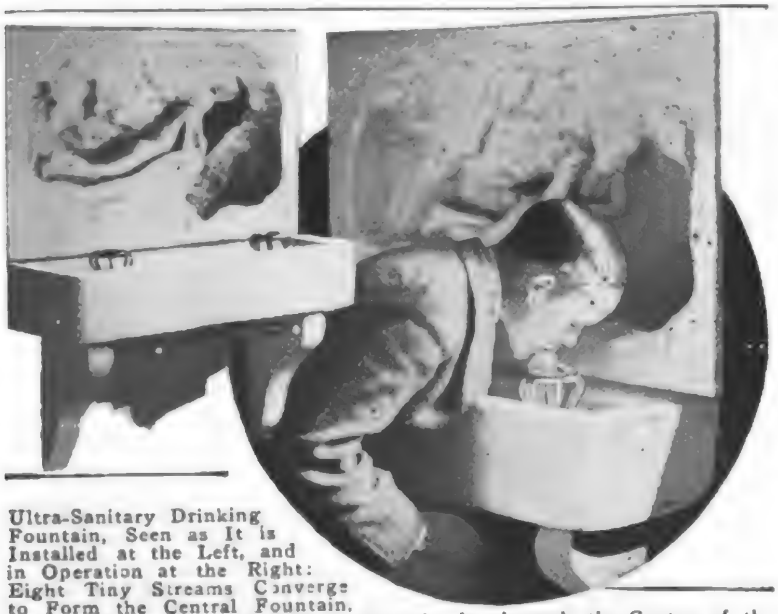
## GERM-FREE DRINKING FOUNTAIN "BENDS" WATER AT AN ANGLE

Not every drinking fountain is germ-free; many are sanitary only in appearance. In the Art Institute of Chicago, however, is placed a fountain that is as hygienic as it is interesting. It is formed of a hollow ring supported upon eight small feed pipes. Around the ring, above the junction with each pipe, are eight outlet holes. When a thirsty visitor to the museum presses the button which controls the flow, eight small jets of water dart from the holes and meet above the center of the ring. Here they unite to produce one vertical column of water. Water contaminated by the lips of the drinker falls back harmlessly through the center of the ring.



Ultra-Sanitary Drinking Fountain, Seen as It is Installed at the Left, and in Operation at the Right: Eight Tiny Streams Converge to Form the Central Fountain, and the Waste Water Falls Back Harmlessly through the Center of the Ring without Touching the Outlet

## WORLD FREED FROM YELLOW FEVER BY SANITATION

Science has at last vanquished yellow fever, it is believed, after a long and tedious struggle, in which sanitation was the chief weapon employed by the victors. The story of what is declared to have been the last stand of the dreaded malady, in Guayaquil, Ecuador, is told in a recent report from South America. Experts from the United States who fought an epidemic there finally brought it under subjection, and no cases have been reported in the city for about three months.

## SEAPLANES TO LOCATE FISH FOR FISHERMEN

The sportsmen who recently used the seaplane for an afternoon's ocean fishing, as described in the October issue of this magazine, may prove to have been pioneers in an important commercial development. Following their lead, an official of the Bureau of Fisheries recently obtained from the Navy Department the use of a seaplane. For an hour and a half he flew along the New Jersey coast, at a constant altitude of 800 ft., and was thus able to locate many schools of fish. Several of the schools were at an estimated depth of ten feet. On his return he reported that the slanting sunlight sometimes lessened visibility, but that, on the whole, the seaplane should be of great service to the large fishing fleets. Informed by wireless of the presence of a school, they will be able to steam directly to the spot.

## QUICKSANDS SWALLOW WRECK OF THE "VALBANERA"

Resting under 40 ft. of water off the Florida coast, but settling fast into the quicksands, is the wreck of a large steamer, identified by divers as the Spanish liner "Valbanera," and believed to have foundered at this point during the recent gulf hurricane. Not a soul survived to tell the story of the disaster; so, if the hull disappears, as seems to be the likelihood, the tragedy may take its place as one of the gruesome mysteries of the sea. As yet the divers have made no attempt to penetrate the cabins and learn what portion of the 488 passengers were still aboard when the steamer sank.

¶A 20,000-hp. airplane and an engineless machine meant to be towed in trains behind an engined airplane, are among the forthcoming developments promised by a famous manufacturer of German air craft.

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# GALLOWS HOLDS ARTIST'S MODEL IN BIZARRE POSES

PERSISTENT questioning by his friends and fellow artists has at last won from a prominent illustrator the method which enables him to portray so successfully the human body in unnatural and fantastic poses. The model is hung by the waist from the arm of a gallows-like frame, which is itself easily movable on its wheels. The supporting wires from the belt run down to a ratchet reel.



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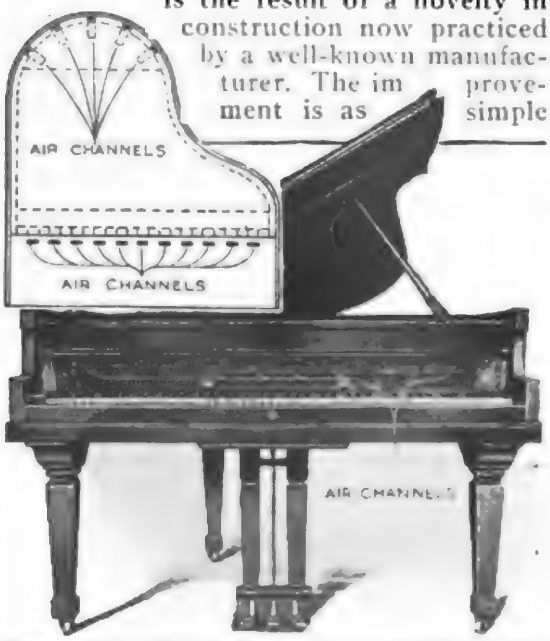
## SLOTS UNDER SOUNDING BOARD INCREASE PIANO-TONE VOLUME

A "baby grand" piano with a tone volume equal to that of a "parlor grand" is the result of a novelty in construction now practiced by a well-known manufacturer. The improvement is as simple




**Locations of Air Slots are Indicated in the Diagram Above and Sketched on the Front View of the Piano**

as it is effective, consisting solely of 15 slots bored in the vertical crosspieces that support the sounding board at front and rear. These slots permit air beneath the sounding board to respond to the vibrations of the latter and to reinforce those from above. Thus this lower air mass, customarily confined and deadened, is able to expand the tonal effect to an increased and unexpected volume, depth, and quality.

## UNIVERSITY TO HAVE CAMPUS ON CHICAGO LAKE SHORE

The cloistered seclusion of the old-time universities is becoming less and less a characteristic of the modern institutions. Typical of the change is the recent decision of Northwestern University to establish a second campus within a mile of Chicago's busy loop district. On a nine-acre lake-shore tract will be erected a hospital and buildings for the departments of law, commerce, medicine, and dentistry. Land and buildings together will cost about $4,450,000. All these plans are contingent, however, on the outcome of a financial campaign for $25,000,000, of which $13,000,000 is to be raised during the present university year.

## QUEER ROAD MIRAGE AT NIGHT MAKES AUTO APPEAR DOUBLE

An unusual and curious modification of the familiar highway mirage, caused by a layer of heated air, is reported from the Sacramento Valley, where the Pacific Highway is of glistening cement. At 9 o'clock on a recent night the lights of an automobile were seen to rise over a distant hilltop, and immediately another pair of lights, nearer but less bright, seemed to be turned on. The more distant lights gradually overtook the nearer, and merged with them, and an instant later a single car passed the observers.

## GERMAN POCKET FLASHLIGHT CONTAINS OWN DYNAMO

A pocket lamp, containing its own dynamo and operated by hand power, has come to light only recently, although captured from a German soldier by an American major in the autumn of 1918. As worn upon the breast, a ring hangs by a chain from the bottom of the apparatus, where it is conveniently reached by the hand when light is desired. As the chain descends it spins an armature through a magnetic field, thus generating current and lighting the bulb. An energetic pull on the chain will keep the bulb lit for five seconds.

**The German Dynamo Flashlight is Shown at the Left as Worn upon the Soldier's Breast. At the Right, the Covers have been Removed to Show the Rear, Above, and the Front, Below. A Sharp Pull on the Ring will Keep the Bulb Lit for a Number of Seconds**

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Separated from Bedrock by a Film of Water, the "Moving Mountain" of Oregon has, for Years, been Slowly Slipping toward Columbia River, at Times Necessitating Relocation of the Railroad Track along the Shore Line. The Scenic Highway has Not been Affected, and the Movement was Recently Stopped by a Tunneling Operation

# ENGINEERS CHECK MOVING MOUNTAIN

## Columbia River Threatened by Peak Which Slips on Moistened Bedrock

By HORACE E. THOMAS

WHEN an entire mountain becomes dissatisfied with its location and starts to slide, it means trouble for whatever happens to be in the way. Anyone who has noticed how even a small slide sweeps everything before it, appreciates the force in a moving mass of earth. When the slide includes a mountain, instead of simply a loose portion of its surface, the movement may be said to be irresistible. If stopped at all, it must be attacked by engineering strategy, for no force will prevail against it.

Moving mountains are rare but not unknown. The United States has had some very costly experience with them along the Panama Canal, as everyone recalls. The troublesome mountains near the canal, however, are mostly mud, and it is easy to understand how they stubbornly ooze their way into the waterway that severs the Americas, making no end of work for the big dredges that are maintained there.

A moving mountain of an entirely different type stands in a commanding position on the Oregon side of the Columbia River, between Cascade locks and Eagle Creek, about 45 miles from Portland. It is known as the "Moving Mountain," although for the past year there has been no movement, and engineers are hoping that they have succeeded, in a fight they have made through several decades, in staying its progress. They are not ready to say that the mountain is conquered, conservatively insisting on at least another year of observation before they will announce that they have won. To the layman, however, it looks very much as though the mountain had come out second best in its struggle to glide into the waters of the Columbia, and that, from now on, it will remain steadfast in its present location, as a well-behaved mountain should.

There has at no time been anything very precipitate about the movement of this Columbia River peak. It might have gone on indefinitely without attracting attention, if it had not been for the construction of a railroad at its base back



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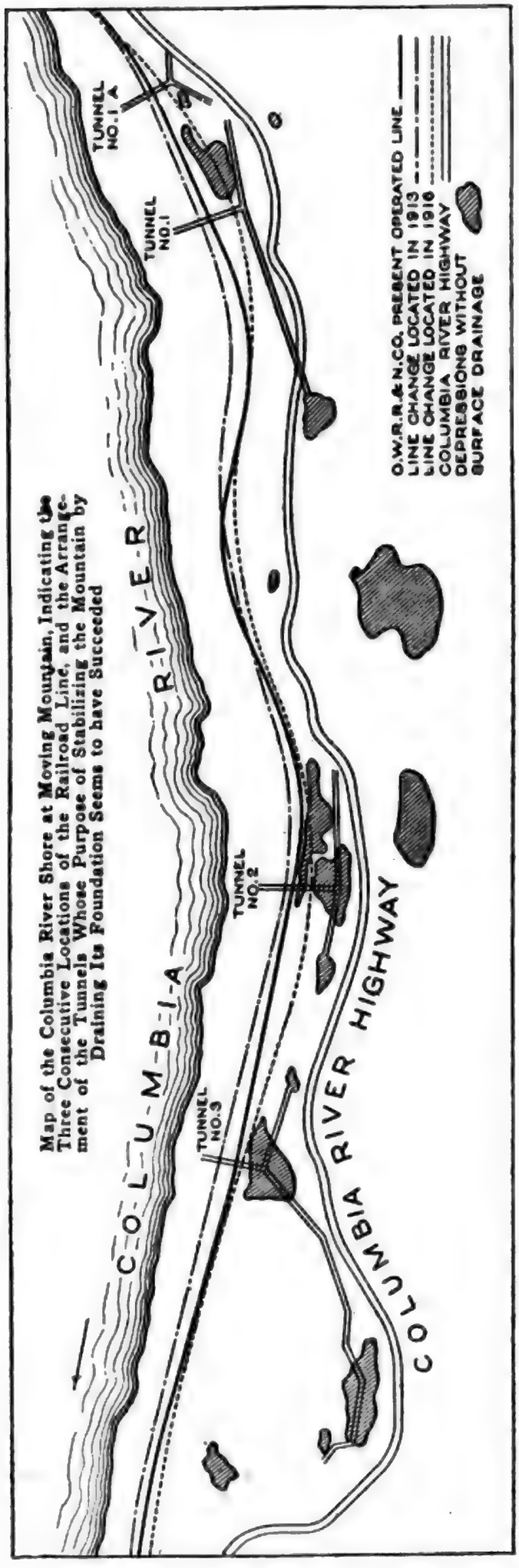


Map of the Columbia River Shore at Moving Mountain, Indicating the Three Consecutive Locations of the Railroad Line, and the Arrangement of the Tunnels Whose Purpose of Stabilizing the Mountain by Draining Its Foundation Seems to have Succeeded

in 1880. The engineers who surveyed the line were greatly surprised to notice, after several months, that some action had affected their location stakes. The change was slight, but sufficient to arouse their curiosity and apprehension. Definite observations were made from month to month, and from these it was determined that the land at this place was sliding toward the Columbia at the rate of 10 to 15 ft. a year. The movement was not great enough to cause abandoning the location, for the route down the Columbia was the only feasible one; and besides, the slide involved no real danger to the railroad then or since. But it did mean a vast annoyance to the railroad engineers, and an expense that has grown into hundreds of thousands of dollars.

At first, it was thought that the disturbance might be confined to a very small and localized area. Experiments quickly proved this premise wrong. It is known now that the movement affects the entire bulk of the mountain, which towers 3,000 ft. above the river, or at least a great segment of it that protrudes from the main peak. It is a point on which the opinion of engineers is divided, but the mass of moving rock and soil is, in either event, so great that the problem of meeting it is the same. While the progress of the slide from 1880 up to last year was not more than 15 ft. annually, it is believed that prior to 1880 the movement was exceedingly variable. Geologists do not know when it started or how rapidly it may have traveled before it came under observation, but they are convinced that its duration has been through many generations.

Unusual conditions combine to impel the movement of the mountain. The country along the river at this place extends for many miles in a series of hills and mountains that slope sharply toward the water. The Moving Mountain itself borders the river for three-quarters of a mile. Its face is a series of serrations, and there are several areas that have no surface outlet. Water gathering in these undrained basins seeps through the soil, reaching bedrock at a level somewhat below the surface of the river. To this drainage water is added seepage from the river, which flows in over the bedrock where it is exposed along the bank. As a result, the mountain rests on a thin film of water that covers the bedrock under its entire base. The tremendous weight on this thoroughly lubricated surface causes the movement. A peculiar

phase of the situation, determined by investigation, is that while the surface of the bedrock on the river bank slopes toward the river, this surface is a chiseled-off edge of the stratification, which really slopes backward and downward into the hill against the direction of the movement. The bedrock itself is an unusual type of shale, which has been termed by geologists the "Eagle Creek formation." The ground above it is a porous mixture of soil, shale, and basalt stones.

It is possible there would have been no soil disturbance if it were not for the excessive rainfall in this district, which averages about 80 in. a year, and has been known to exceed 100 in. It is one of the dampest localities in the United States. The Columbia River rainy season is chiefly from November to June, so that the mountain reaches its point of highest saturation in the spring, and it is at this season that the movement is at its maximum.

The constant creeping of the soil into the Columbia, like an earth glacier, would have shoaled the river long ago had it not been for the swift current at this place. The average flow of the water here is from 8 to 10 miles an hour, while at high stages it attains a velocity of 12 miles. This swift current, which is immediately below the dashing, foaming Cascades of the Columbia, carries away material from the slide as fast as it reaches the water.

Little Streams Like This One Form a Network among the Mountains of the Columbia River Valley, and Cause Landslides by Loosening the Earth

As the railroad traverses the slide for its full length, the tracks needed frequent attention. Quite often, small sections had to be moved, bridges erected, and fills made, while on occasions it was necessary to change the location of the rails for the full distance. This, obviously, was an expensive process, and engineers at once set about remedying the trouble at its source by stopping the slide. Until recently, surface drainage was depended on to accomplish this. Efforts were made to drain the low areas, for it was reasoned that if the water did not permeate the mountain, the slide would stop. Surface drainage, however, proved a failure, for despite long-continued efforts in this direction, the slide persisted, with its progress diminished little if at all.

The new plan of attack, which has stopped the slide, at least temporarily, consists of a series of drainage tunnels. They were built in 1918, after a long series of experiments to determine the points of greatest movement. The portals of the tunnels are at about normal high-water level of the river, and they have a depth of 50 ft. When the tunnels had penetrated the mountain for some distance drifts were dug at right angles to reach the most advantageous locations.

The tunnels have offered drainage for the film of water that covered the bedrock surface, and a large volume of water has been concentrated in them. As soon as the tunnels were completed, last year, the slide movement ended and has not, so far, recurred.

The famous Columbia River Highway now parallels the railroad at the base of the Moving Mountain. It had been built only a short time before the slide was stopped and was not affected. If the movement should begin again, frequent changes of the highway, as well as the railroad, would be necessary. However, this is a contingency that is not anticipated, for it is generally believed that the tunnels have solved the difficulty permanently.

The Moving Mountain comes by its migratory tendencies quite naturally. There are a great many slides all about

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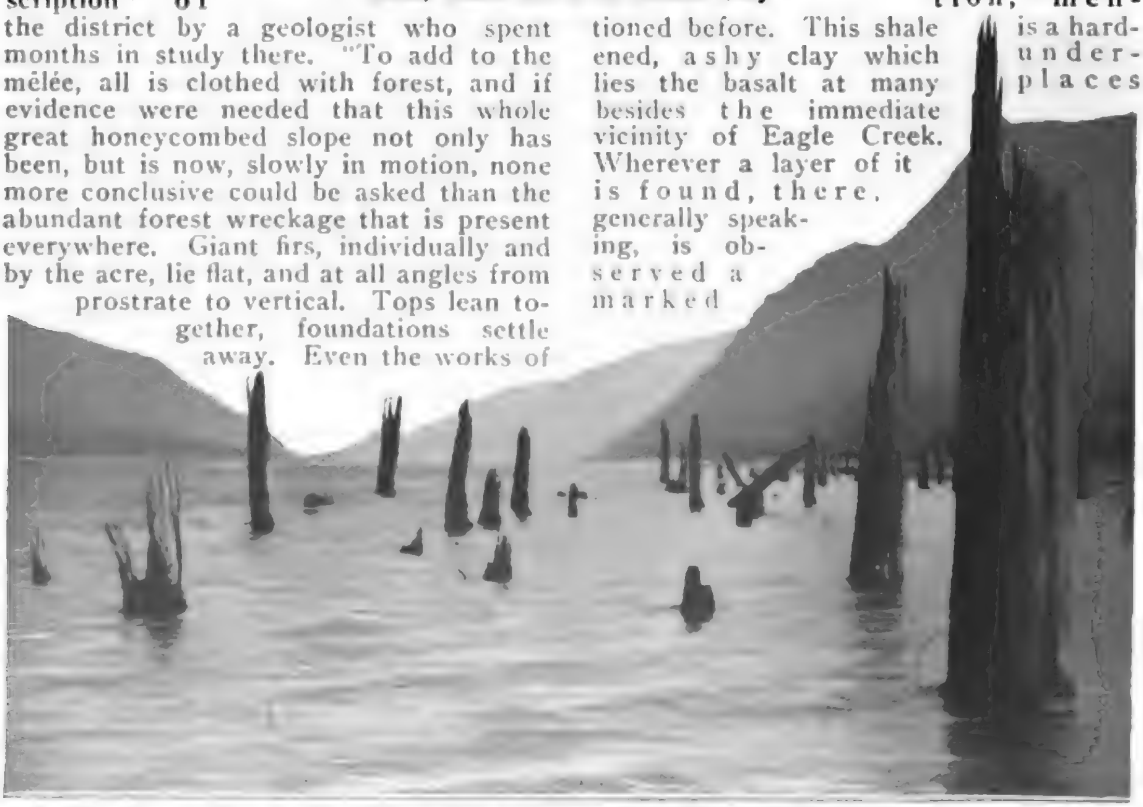
it along the Columbia Gorge, where the river has bisected the Cascade Range. Some of the slides are still active, while the activity of others has ceased. "The land surface is one of pit and ridge, of inclosed swale and crumbling, tilted divides, of clogged drainage, wherein streams drop from sight, springs issue and disappear, ponds fill, then mysteriously depart," runs a graphic description of the district by a geologist who spent months in study there. "To add to the mêlée, all is clothed with forest, and if evidence were needed that this whole great honeycombed slope not only has been, but is now, slowly in motion, none more conclusive could be asked than the abundant forest wreckage that is present everywhere. Giant firs, individually and by the acre, lie flat, and at all angles from prostrate to vertical. Tops lean together, foundations settle away. Even the works of man are not exempt; buildings are carried out of plumb, trails offset, roads upheaved; and at the river's edge on both sides, we are told, the railroad rights of way refuse to remain within statutory bounds. In a word, this entire area is one of landslides, landslides of the past and landslides that are now, while we watch, taking place."

Part of the Submerged Forest in the Foreground. Across the River, Shellrock Mountain, Afflicted with Small Landslides, Which Are of the Surface Only

So much slipping and sliding is attributed chiefly to the "Eagle Creek formation," mentioned before. This shale is a hard-ened, ashy clay which underlies the basalt at many places besides the immediate vicinity of Eagle Creek. Wherever a layer of it is found, there, generally speaking, is observed a marked



View down the Columbia River through the Submerged Forest, or Rather Its Desolate Remains: Plainly a Region That Was Once High and Dry on Shore, Indicating the Possible Fate of Other Lands along the River

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tendency to slip over its surface. The entire gorge of the Columbia may almost be termed a cañon. Its precipitous cliffs rise from a few hundred to several thousand feet close beside the river on both the Oregon and Washington shores. The whole history of the gorge has been a series of slides; as the stream cut into the beds of shale these dissolved, and the hardened lavas above dropped into the current and were carried away. In many places, as has been said, this process is still going on. It is predicted that at certain locations it will continue until the majestic Columbia, which discharges into the Pacific each year 16 cubic miles of water, will flow between gently sloping banks. Such a transformation, if it takes place, will be a process of ages and something that will be seen only by our descendants in the dim and distant future.

One of the most remarkable of the slides along the Columbia lies on the Oregon shore, opposite the village of Wyeth, seven miles east of Cascade locks. Here an entire forest has slipped into the river. So gradual was the movement and so large the mass of earth that the trees, or many of them, still stand upright in the stream.

The "Submerged Forest" is known by all who are familiar with the Columbia. At normal stages of the water the tops of the highest trees barely protrude above the current. It gives an uncanny feeling to the boatman to ride over the tops of these ancient trees, which can be seen distinctly in the clear water beneath. The submerged forest has had its part in the Indian legends with which the Columbia Gorge abounds. One version of the legend of the famous "Bridge of the Gods," which tradition says once spanned the Columbia, a great natural arch, is that these trees grew upon it, and that they remained standing when the gods in anger destroyed the bridge and it collapsed into the stream. Scientists now are agreed that the Bridge of the Gods is only a myth. But scarcely less wonderful than this and the other traditions that cling around the greatest river of the West are the land movements that are now going on as Nature carves anew the outlines of the mighty gorge of the Columbia.

## OCEAN LINERS WILL BURN OIL AND SAVE COAL AND LABOR

The economies and advantages of oil fuel for the propulsion of ocean liners has been so well demonstrated that the giant "Leviathan" is to be converted to an oil burner by the U. S. Shipping Board. A number of other big passenger ships also will be changed to use liquid fuel, among them the "Olympic," the "Aquitania," the "Mauretania," and possibly the "Imperator." As an example of the saving thus to be effected, it is stated that a 20,000-ton ship requires 3,000 tons of coal for a transatlantic trip, as against 1,500 tons of oil, and the latter can be loaded in 12 hours, the coal taking three days or more. The subtraction of 50 men from the engine-room staff, a reduction of roughly 75 per cent, is an even more important consequence of oil burning, from the economical standpoint, because of the wage situation. Just now, however, the conservation of coal is the interesting feature of the new project.

## FOOT-POWER AUTOMOBILE IS SERIOUS VEHICLE ABROAD

Those little foot-power automobiles that are known only as children's toys in this country are being taken quite seriously abroad, with the increasing cost of gas power. A two-seated tandem model made in France is now becoming popular in England at a price

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French Foot-Power Automobile for Two Passengers, with Regular Car Springs and Pneumatic Tires, Now Popular Abroad: The Steps on the Side Take the Place of Doors

seemingly high enough to include an engine instead of pedals. The body has no door, steps being provided for entrance over the side. Semielliptical springs and pneumatic tires make the car usable on the road.

## CONFINE TRACTORS TO FIELD WITH SUBSTANTIAL FENCE

Surrounding the tractor-testing field at the University of Nebraska is a fence of unusual appearance and strength, designed to prevent the machines from being piloted off the inclosed area by inexperienced student drivers. Massive concrete posts, 3 ft. high and situated 8 ft. apart, are connected by a heavy chain which passes through holes near their tops. This barrier stops the tractors with a minimum of damage.

Unruly Tractors are Kept within the Testing Field of the University of Nebraska by a Sturdy Fence of Concrete Posts and Chain

## VALVE MAINTAINS UNIFORM PRESSURE IN BALLOONS

If the dirigible, kite, or other balloon be likened to a huge beast of the air, the large valve which maintains uniformity of gas pressure must be termed its "lungs." Placed often in the nose of a dirigible, and controlled from the pilot's seat, when necessary, by a cord, the valve opens and shuts automatically when hydrogen must be released to effect stabilization. Were this vital mechanism to stop functioning during a rapid rise of the balloon, it is evident that the gas would expand the bag to the breaking point as the outer air pressure decreased. The valve was originally designed by a Frenchman, but has been greatly improved for use in the American navy.

The Complete Valve of the Left View is Seen at the Right with Its Casing Removed, and the Center View Shows the Way It is Installed in a Balloon

## INEXPENSIVE COATING FOUND FOR SAFETY-MATCH BOXES

A comparatively cheap material for coating ignition surfaces on safety-match boxes is being manufactured in a Slovakian city as a substitute for antimony, commonly used for this purpose, but now very scarce and high in price. Besides being low in cost, the product is declared to be much lighter and more efficient than the substance it is intended to supplant. A smaller proportion of certain expensive and easily ignited chemicals is required in match heads and on striking surfaces, if the composition is used, it has been revealed by tests.

## VIOLIN ATTACHMENT MAKES FALSE NOTES IMPOSSIBLE

Although many teachers of the violin condemn any mechanical aids to instruction, the ingenuity of a new fingerboard attachment will in itself win attention. Clamping the attachment upon the fingerboard, the pupil depresses the strings by means of small semicircular studs or stops. Fingering is thus made mechanically exact.

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The Semicircular Studs on This Violin Attachment Enable the Beginner to Avoid False Notes by Depressing the Strings Only at the Proper Points

¶ From certain South Sea islands for which Japan is now "mandatory" 41 natives have recently been brought for a month's visit to their new mother country. The government plans to entertain a similar delegation each year.

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# TALKS OVER BEAM OF LIGHT BY OLD IDEA MADE NEW

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**Using the Improved Transmitter It Is Possible to Make a Beam of Light Bear a Conversation between Points a Mile and a Half Apart. The Diagram Explains the General Arrangement of the Transmitter and Receiver, and Suggests the Value of the Invention for Military Use. It Is Obviously Impossible for an Enemy to "Listen In" Secretly as He may So Easily Do with the Electric System Now in Vogue**

When the inventor of the telephone devised his "photophone" and talked along a beam of light in 1889, he accomplished a scientific marvel. But apparently his ingenuity was not sufficiently appreciated to encourage practical development; for the idea—it was scarcely more than that—has lain dormant all these years. The announcement of its sudden appearance in usable form, and its actual application to war signaling, comes now with all the force of new discovery.

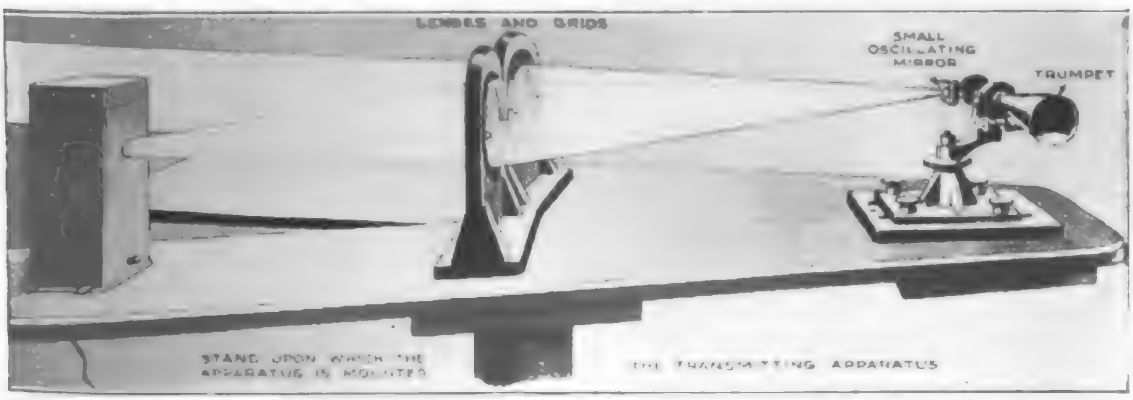
The photophone's method of operation is essentially the vibration of a beam of light by reflecting it from a diaphragm against which sound waves are directed. The receiver is a cell of selenium, which changes its electrical resistance with the variation of light falling upon it. When the selenium is connected in series with a telephone receiver and a source of current, the receiver diaphragm vibrates in exact accordance with the transmitter diaphragm. This was the original device.

The improvement, made by an English inventor, is simple but quite effective. It consists in throwing light upon the sending diaphragm through a grid, or plate containing fine parallel slits, making an image on the diaphragm mirror of alternate light and dark lines, concentrated by a lens. The composite beam thus reflected passes through a second similar grid and lens, and then to the distant receiver. As the sending mirror vibrates, it is the interference of the second grid with the reflected image of the first that gives the light fluctuations sufficient variation for practical use. With this equipment, whispers were audible at a mile and a half, using 20-in. projectors and sunlight, while a carbon arc gave good results up to one-half mile.

## PREPARE FOR TRIAL TRIP OF LARGEST AIRPLANE

The French airman, Lecointe, reputed to have been the first to guide an airplane over a three-mile course in one minute's time, has now been chosen to pilot, on its trial trip, the world's largest plane. Unfortunately a detailed description of the big craft cannot be secured from the manufacturers at this time. It is divulged, however, that the wing span is 175 ft., which exceeds by 49 ft. the measure of the famous Handley Page four-engine bombers. Despite its size, the ship is expected to attain a speed of 120 miles an hour.

¶The Barnard statue of Lincoln, about which lately centered so much discussion, has at last found a home. It has been presented to the city of Manchester, Eng.

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**This Picture Illustrates in Greater Detail the Improved Transmitting Apparatus. Light from the Source at the Left Filters through the Bars of the Grid and Is Focused on the Mirror. Oscillated by the Vibrations of the Human Voice, This Little Mirror Reflects the Light against the Second Grid. A Shutterlike Effect is Thus Obtained, the Final Transmitted Beam Varying in Character with the Sounds Made**

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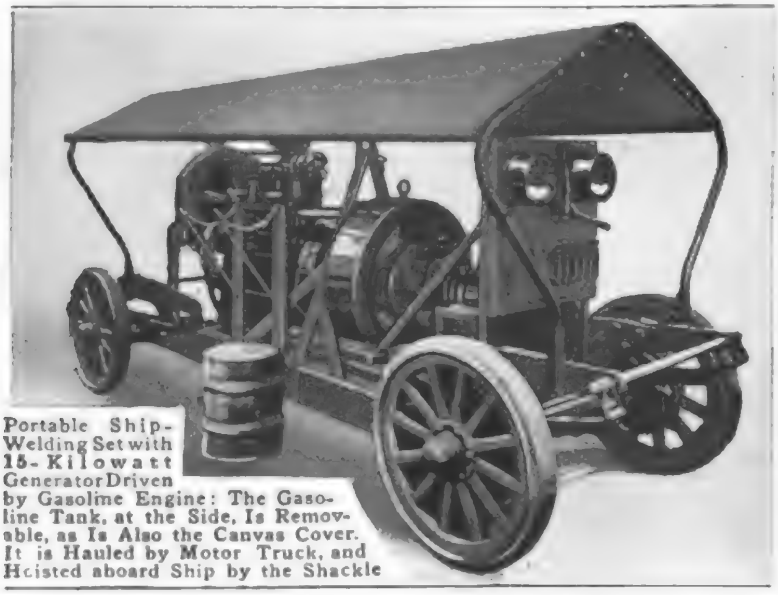
## SHIP-WELDING SET RUSHES TO JOB ON TRUCK

For the quick repair of ships along the San Francisco water front, an emergency welding outfit has been mounted on a wheeled frame which allows it to be hauled by a motor truck at 20 miles an hour. When it arrives at the job, it is swung aboard the ship by a shackle fixed above its center of gravity. To assure its balance while hoisting, and for safety at night, the gasoline tank is removable. A welding generator of 15 kw., gasoline-engine driven, is supplied with several hundred feet of cable, and welding terminals for two arcs. An air compressor and welding pressure tank permit chipping and scaling work, as well as welding, to be done. For protection in the open, a canvas cover is supported by a removable frame of piping at each end. The engine is cooled by water pumped from the sea.



Portable Ship-Welding Set with 15-Kilowatt Generator Driven by Gasoline Engine: The Gasoline Tank, at the Side, Is Removable, as Is Also the Canvas Cover. It is Hauled by Motor Truck, and Hoisted aboard Ship by the Shackle

## TYPEWRITER AND WADING POOL FOR MONKEYS

From California, London, and Benares, India, the camera sends the photographs on this and the opposite pages as evidence of simian intelligence and similarity to man. Most noteworthy is "Joe Martin," orang-outang by birth and motion-picture actor by profession, who plays stellar rôles in many melodramas. "Joe" is under constant instruction by his trainer, and already handles a typewriter with an appearance of professional skill. He inserts and removes the paper, punches indicated keys, and balks only at "taking dictation."

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This Long-Tailed Variety of the Monkey Tribe is Treated with Reverent Care in Benares, India, and in Many Near-By Villages. The Sacred Animals Supplement the Offerings of the Faithful by Regular Tours of the Public Garbage Heaps

The smaller animals in the London zoo recently gave the lie to the popular belief that a monkey hates water, by frolicking in a pool provided experimentally in their outdoor cage. Spectators were delighted to see the troup halt at the brink for a moment's admiring inspection, then wade in boldly. In an instant several were splashing each other like human merry-makers, while others washed faces and hands, or enticed the few timid ones to join in the fun.

The Indian scene shows a street in Benares.

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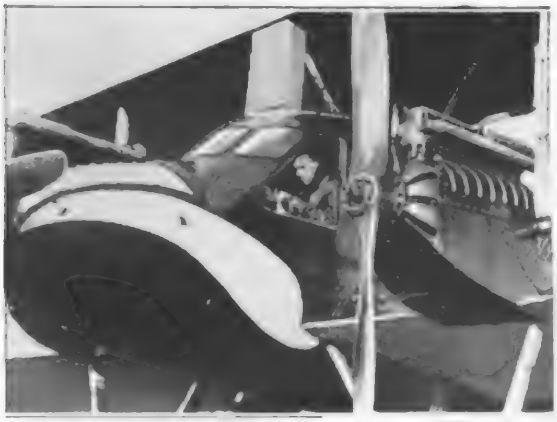
## NOVICES FASHION MONUMENT OF REINFORCED CONCRETE

Even unskilled hands can produce satisfactory results with concrete. This is proved by a cross of that material, erected near Lewistown, Pa., by iron workers, directed by a priest, in honor of the men from the local parish who entered the army and navy during the war. The unusual monument is 21 ft. high, with a horizontal arm 9 ft. 4 in. long. It weighs, with its base, 12 tons, and is reinforced with 800 lb. of iron. A 14 by 16-in. metal plate, set in one side of the upright, bears the names of 42 service men. The cross was designed by the minister.

## AMERICA'S FIRST TRI-MOTORED LAND PLANE PASSES TESTS

Distinguished as the first three-motored land airplane to be designed and built in the United States, and incidentally as one of the country's few large passenger-carrying machines, is the "Eagle," a graceful commercial craft recently demonstrated by the Curtiss company. The inclosed fuselage seats eight in individual wicker chairs, each beside a window of unbreakable glass. In the nose, facing their controls, sit the two pilots. The safety of the passengers in flight is assured by the triple nature of the power plant, any unit of which can maintain flight when the plane is not loaded to capacity. The interesting tandem arrangement of the undercarriage reduces the risks of landing.



Through the Open Window in This New Three-Motored Commercial Plane is Seen Roland Rohlfs, Famous High-Altitude Pilot

PHOTOS COPYRIGHT, WESTERN NEWSPAPER UNION

**A Flying Radius of 475 Miles, a Maximum Speed of 107 Miles an Hour, a Triple Power Plant, Substantial Undercarriage, and a Comfortable Cabin, All Combine to Make the "Eagle" a Reliable and Satisfactory Passenger Carrier**

## TOMB OF CANADIAN TRAPPER IS LONELY LOG CABIN

A humble log cabin which stands in a trackless forest near Lake Athabasca, in western Canada, was once the home of a fur trapper, its builder. Now it is a tomb, sheltering the frozen body of its former occupant, who died there, alone and unaided, nearly two years ago. To investigate the cause of the trapper's death, a fearless member of the Royal Northwest Mounted Police journeyed to the desolate scene in midwinter, braving the terrors of the wilderness for months before reaching his objective, situated miles from railroads and civilization. The corpse was in a perfect state of preservation, due to the cold, dry air, and was not moved from the bunk on which the trapper passed away.

## SIMPLE STEEL JETTIES STOP CUTTING OF RIVER BANKS

After all the riprapping of river banks, the driving of piles, and building of willow mattresses to stay the enormous destruction of property by flood waters, a Kansas inventor has checked the erosive

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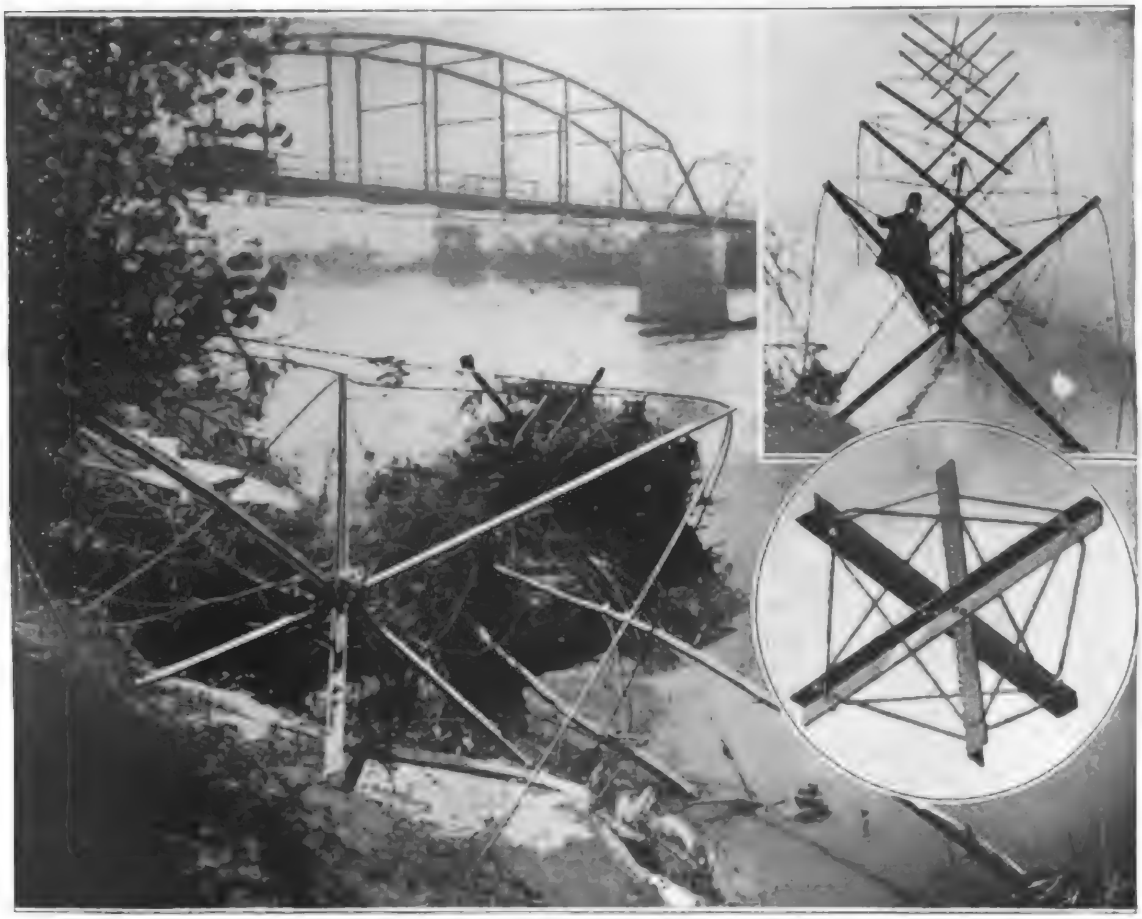
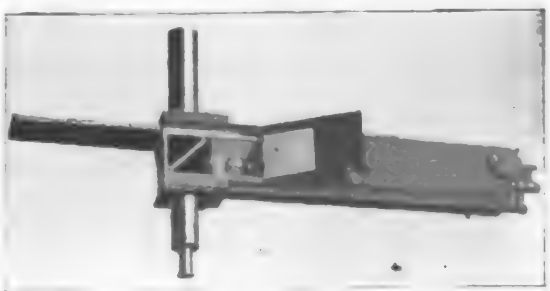


**The Appearance of the Steel Jetty, After Nature has Given Its Assistance, is Seen in the Large Picture; the Upper Insert Shows a Newly Installed Six-Unit Jetty, and the Lower a Steel Unit in Detail**

process with the simplest of devices. His invention consists of three similar lengths of angle iron, bolted together at right angles at their centers, making a figure like the "jacks" of children's games. Four or more of these units are strung on a cable through their centers, one end of which is anchored to the river bank. The protruding ends of each "jack" are also wired together. The outer end of this improvised steel jetty is then flung out into the current, which begins at once to deposit brush and silt about the multiplex legs of the strange dike. Presently a new point of land is formed, and the river has returned what it stole away.

## MAKE INSTRUMENT TO GAUGE VISIBILITY OF VESSELS

To reduce the protective coloration of ships to an exact science, a "visibility meter" has been developed in an American laboratory. By means of a transparent reflector at a 45° angle, the observer sees simultaneously a lens image of the object and a translucent screen illuminated by a small electric lamp. Turning a thumb disk moves a wedge of gray glass behind the object lens and changes the position of the lamp, thus altering the relative brilliancy of the image and the glare of the translucent screen. The optical field is bisected, one half appearing brighter than the other, for photometric comparison. In use, the image is reduced to low visibility and compared with a standard test plane of canvas painted a flat white.



COURTESY OF THE JOURNAL OF THE FRANKLIN INSTITUTE

**Visibility Meter Open, Revealing 45-Degree Mirror, Translucent Screen with Lamp, and Wedge**

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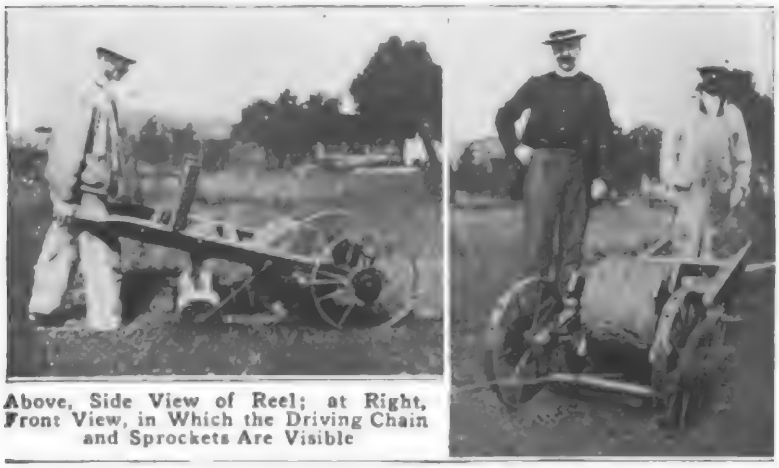
## WIRE AND ROPE CONVENIENTLY REELED ON SIMPLE MACHINE

The effort required to reel and unreel the lengths of barbed wire, rope, hose, and chain used daily in a dozen industries is largely reduced by a wheelbarrowlike machine of recent invention. Thus, to reel in loose wire, the owner of this machine simply pushes it along with the two front wheels astraddle the wire. As the wheels turn they revolve the reel through a chain-and-sprocket drive. To reverse the operation, and unreel the wire, the operator throws the chain off the sprockets, permitting the reel to revolve freely. The reel may easily be removed to permit the insertion of another.



Above, Side View of Reel; at Right, Front View, in Which the Driving Chain and Sprockets Are Visible

## FIBER BOARD USED TO MAKE HOLDER FOR INK BOTTLE

Uncorked ink bottles are a source of danger on desks and drafting boards, because of the possibility of their being overturned. For preventing such accidents, a simple holder, made from a small square of fiber board, has been invented by a Kansan, who applied not long ago for a patent on the unusual inkstand. A circular opening is provided in the center of the material by dividing a circle of proper size into 12 sectors, and bending the latter at right angles to the sheet. When a bottle is placed in the opening, the sectors act as lugs to hold it in place.

## X-RAY ANALYZES CHEMICALS LIKE A SPECTROSCOPE

A method of analyzing chemicals by means of X-rays, used in a manner suggesting the spectroscope, has been developed in a large American industrial laboratory. The X-rays are passed first through a monochromatic filter which absorbs all but one wave length, and then through two narrow slits, reducing them to a beam about 1/25 in. wide. The material to be analyzed, in powder form, is placed in a small tube in the path of the beam, and the rays transmitted are registered on a photographic plate. Minute variations in crystalline structure are shown as fine lines, parallel to the main image, and their pattern and degree of separation indicates, to the practiced eye, the composition of the chemical.

## PEARLS NO OYSTER MONOPOLY: TRIPE YIELDS THEM TOO

True pearls, from 1/32 to 1/16 in. in size, were found in large numbers on the mucous surfaces of a recent shipment of tripe received in England from the United States. That the occurrence was not unusual, but had merely escaped previous notice, was shown by the examination of fresh specimens taken from native cows. The pearls were soft, of course, each imbedded in a cyst, and apparently developed, just as in a bivalve, by the casting of a protective mucous wall about some intruding parasite.

## CITY SAVES FORTUNE IN SOAP BY SOFTENING ITS WATER

It is generally known that hard water requires more soap for the same results than soft water, but the scale on which the city of St. Louis has demonstrated the fact is quite unusual. The municipal precipitation plant is computed to have saved the people $260,000 in soap alone in the last year, which is more than the cost of chemicals and labor for the process. Over 400,000 tons of solids, mostly sand, were taken from 37,751,000,000 gal. of water during the year.

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# COMMENT AND REVIEW

[This page was printed Oct. 27, 1919]

FROM the shapeless heaps of ruins in what were once towns and villages in Belgium and France, the dull débris is already taking on the outlines of streets and building lots. The impoverished owner returns to a staggeringly hopeless prospect, but he spares no effort to do his part toward the restoration of his beloved city. The hours of daylight are all too short, his physical endurance incapable to measure up to the effort of his ambition.

*Stop*
*Look*
*Listen*

In Germany, tremendous activity is putting forth its trained hand, guided by that marvelous ability for organizing industrial operations, and before the rest of the world realizes, German goods will again be flooding the markets of every continent. To regain their lost trade, they aim to undersell other nations, especially the United States. In order that they may undersell, the German workman—to whom no sacrifice for the Fatherland is too great—is already feverishly working 10 and 12 hours per day in the factories of that country.

There are not wanting those who believe that much of the agitation in this country, the fomented unrest, the demand for the six-hour day, and five-day week, finds its inspiration in anything but a sincere desire to benefit American workmen. It is certainly very plain that whatever clogs the wheels of production in any one country, making that production smaller in quantity and higher in cost, reverts to the great advantage of any other country whose manufacturing costs are less. This is not to say it is desirable to work 12 hours a day, nor that more than eight hours a day is necessary in the great majority of occupations, nor further, that by a natural process of development and invention, the work of the world may not be eventually accomplished in a six or five or four-hour day.

But I do assert there never was in the world's history such need of production as now, and if all the workers of the world, including labor unions, in order to get supplies back to pre-war normal, would turn in and work diligently, with their old pre-war pep in what they do, for ten or even eight hours a day for a short time, the result would be felt in lower prices almost immediately. Instead, the present attitude of labor unions is to arbitrarily demand a decreased production at a higher cost, and base their demands on the resulting higher cost, for more, and more, utterly regardless of the effect on the larger body of workers who belong to no union. And the profiteers are just as bad, or worse, for they have a wider vision and a better realization of what they are doing. It seems to be a sort of industrial joy ride in which each group is trying to outrun the rest, regardless of who, or how many, are run over in the race.

I think the sanest statement on conditions today was uttered by Secretary of the Interior Lane, when he said:

*"Oh, for a few days of real sanity, when with composed nerves and calm judgment, and without bitterness of feeling, we could look at our problems and meet them with our traditional hopefulness and confidence."*

What we all need is coöperation; less selfishness for ourselves and the group to which we belong, and more regard for the rights of others. The war has left us all more or less affected by shell shock, with blurred vision and shattered nerves. The ideals of the millennium cannot be achieved or forced by any process of legislation by Government, or the fiat of organized labor. It can only come as fast as an overwhelming public sentiment believes in and supports it. This is a growth, not a miracle. Any other way is futile, just as national prohibition was the result of 50 years of effort and education, and could not and did not arrive until time had done its work.

When labor officials, intoxicated with success, attempt to paralyze the industries and welfare of the entire nation with a coal strike, coupled with the threat to call out all union members in every other line of industry, it becomes evident that some labor leaders have utterly lost their heads, and no longer realize what are the real and best interests of their own members. The attitude of some labor leaders during the past few weeks has unfortunately set back the cause of labor. The ideals and hopes of President Wilson have been interpreted as license, and Labor, while being led out of Egypt, is being led into the Wilderness. It is up to those same leaders and that great majority of union members who, following lines of least resistance, have allowed the radicals and ambitious leaders to dominate them, now to do some plain thinking on their own account and get the cause of labor squarely on its feet once more.

H. H. WINDSOR

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At Noon, on October 16, in a Cornfield 40 Miles West of Omaha, a Broken Crankshaft Forced Maynard to the Ground, and, Seemingly, Out of the Race. But within Ten Minutes He Learned of a Disabled Ship on the Ground 10 Miles Away, and "Went into Action" at Once. Securing a Truck and Tackle from a Near-By Town, He Lifted the Engine from the Damaged Airplane, and Hurried with It Back to His Own. By the Glare of Headlights and Bonfires, He Labored All Night, and at Sunrise Was in the Race Again

# "FLYING PARSON" FIRST TO COMPLETE LONGEST AIR RACE IN HISTORY

By PAUL A. JENKINS

SEVERAL purposes doubtless impelled the Air Service authorities to announce in September an aerial race from coast to coast. Foremost, no doubt, in their minds was the desire to awaken the American voter, and through him the American congressman, to an appreciation of the airplane as a military weapon. America must realize that the invader who will some day force a landing on the California coast will, three or four days later, dot the skies above New York City with his bombing planes.

And to the Air Service itself the race was to demonstrate the relative reliability of various types of planes and motors, to furnish meteorological data for the still crude air charts of this country, and thus to help the United States keep abreast of aviation's progress.

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**This Is the "DH-4" and Its Crew That Finished First in the Air Race from Coast to Coast and Back. Lieutenant Belvin W. Maynard Is at the Right, and Sergeant W. E. Klein, at the Left, with "Trixie," the Mascot, in the Center**

The selected course led from Mineola, Long Island, 100 ft. above sea level; westward across state after state, to the mountains of Wyoming, Utah, and California, which are sometimes 6,000 ft. above the sea; and finally to the Presidio in San Francisco, at practically ocean level again. From coast to coast and back the course was figured to be 5,402 miles, or about the length of a sea voyage from New York to Petrograd, Russia. The rules were relatively few, requiring chiefly that each contestant fly only between sunrise and sunset, not on Sundays or in impossible weather, and that he stop for at least 30 minutes at each of the 20 intermediate control stations. Prizes were to be awarded, much as in the New York-Toronto Derby, under a triple system embracing elapsed time irrespective of efficiency and flying time, actual flying time as calculated between control stations, and flying time based on handicaps.

The contest was exclusively miltary, so participation was limited to army airmen and army machines. The list of pilots entered at starting time totaled more than 80 names, and included those of several American "aces," and, by military courtesy, those of two foreign attachés. The great majority of the planes were American DH-4's, powered by 400-hp. Liberty engines, although others were of French, British, Italian, and German origin, driven by Hispano-Suiza, Mercedes, Rolls-Royce, Clerget, and other motors.

Simultaneously from east and west on the morning of Wednesday, October 8, the air race started. Plane after plane roared into the air at intervals of a few minutes, until 47 had left the eastern metropolis, and 15 San Francisco. A few of these were to finish the long grind, but many were destined to crash to earth, others to wear themselves out against the buffetings of rain and snow. One plane was to fall into Lake Erie, another to collide with an abrupt mountainside in Utah. The adventures of all contestants, the stories of too many tragic deaths, would easily fill a volume.

Interest aplenty, however, is found in the single story of one competitor, once a preacher, later a fearless tester of America's war airplanes, and recently one of the winners in the international air handicap between New York and Toronto. By Wednesday evening, Lieut. B. W. Maynard led the entire field. Spending the night in Chicago, he learned of pursuers at Cleveland, and rivals from the west at Salt Lake City. Thursday gave him the roughest weather of the entire trip, but saw him at evening in Cheyenne, Wyo. A westerner had reached Omaha, while other competitors were scattered across the breadth of the United States. Here in Cheyenne Maynard was held all Friday morning by the bursting of his radiator.

Friday night he slept at Salduro, Utah,



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just 2,183 miles from Mineola, yet hard pressed by three fleet westerners who spent the night at Bryan, Ohio. In the morning he rose 13,000 ft. to clear the mountains, and a little after 1:00 p. m. slipped out of the fog to the ground at San Francisco. Two hours later two westerners arrived, within 20 seconds of each other, at the eastern terminus.

Tuesday afternoon saw him on his way once more, first of the racers to start upon the return trip. Good fortune flew with him during that day and the next, actually showing him an opening between two snow blizzards while over Wyoming. Thursday noon, however, when only 40 miles from Omaha, his crankshaft snapped and forced a hazardous landing in a fence-hemmed cornfield. For some men, the race would have ended here, but not for the "flying parson." Displaying an energy that will some day dismay the evildoer in his parish, he wired to Washington for permission to use an engine from the Martin bomber, stranded some ten miles away. While waiting for permission, he got the engine.

Laboring all that night in the cornfield, with the friendly assistance of local people, the plucky parson and his clever mechanic in the morning climbed into a rebuilt plane.

Then came a tremendous spurt of 738 miles, that included every short cut and the hazard of a flight across Lake Michigan. For, though still leader, Maynard was now pursued by five who were doubling back from 'Frisco, while five from the Pacific had turned back from Mineola. But good fortune now joined hands again with skill, and Saturday found him once more in Mineola, this time hailed as first to finish the transcontinental Derby, and recognized king of America's airmen. His nearest competitors from the east were at Buffalo; from the west, at Omaha.

As this magazine goes to press it is learned that, because of his unavoidable mishaps, Maynard's computed flying time is set at 67 hours, a figure which has been bettered by several later arrivals at Mineola. To others will consequently be awarded the prize for the shortest flying time, and, probably, for flying time as revised on the handicap basis. Yet these secondary defeats by worthy rivals can little dim the honor of Maynard's victory, achieved by his skill, expertness, and pluck. The "flying parson" was first to finish the longest air race in history.

## JAPANESE ROADSTER WEIGHS ONLY 120 POUNDS

A practical three-wheeled automobile which weighs only 120 lb. is the recent invention of a Japanese army officer. The little vehicle is powered and steered by the 3-hp. motor wheel in front. Behind the chauffeur, who straddles the frame, sits a passenger in a midget tonneau equipped with side doors and a folding top. The mounting of the body on the rear wheels is unusual for so small a car. The short stub axles project from a rectangular frame the rear end of which bears the body on coil springs, while the front end is coupled to the body by a universal joint.

The Three-Horsepower, Two-Speed Engine in the Front Wheel Takes This Little Motor Car Along the Roads of Japan at a Lively Clip. The Inventor, an Officer in the Japanese Army, Has Attempted to Make the Little Car a Mechanism of Utmost Simplicity

## PLAN TO FILM WHOLE BIBLE

Most ambitious of all projects of the motion-picture art, celebrated for its extraordinary aspirations, is the plan to film the entire Bible. This momentous effort is already in process of organization in a California studio, and is estimated to need two years for its completion. The specifications call for 100 reels of film, certain scenes of which will gather together the greatest assemblies ever shown on a screen.

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This Front View of Monsieur Blériot's Newest Creation Suggests Its Dimensions by Contrast with the Scout Planes under the Wings. By Mounting the Four 250-Horsepower Engines in This Way, Rather Than in Tandem Pairs, Each Propeller Acts on Undisturbed Air, and, to This Designer's Belief, Develops More Power

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The Whalelike Profile of the Fuselage is Seen in This View of the Newest French Airbus. Within Are Seats for 28 Passengers, Exclusive of the Crew. In Providing the Heavy, Tandem Undercarriages the Builder has Evidently been Willing to Sacrifice Speed to Gain Safety for the Passengers. The Banjo-like Projections from the Leading Edge of Each Lower Wing Are Worth Study Also

## HUGE BIPLANE DESCENDANT OF CROSS-CHANNEL BUS

In contrast to the fragile little 35-hp. monoplane in which he flew across the English Channel in 1909, appears M. Blériot's latest production, a substantial biplane airbus driven by four engines of 250 hp. each. The two creations are strikingly dissimilar, yet are alike in evidencing the pioneer's courage to depart from conventional practice. As his monoplane was the first successfully to mount a tractor air screw, so the big air liner is seen to incorporate the engine mountings in the wing structures, two above and two below. The fuselage is notable for a proportionate "stubbiness," which is accentuated by its height, odd streamlining, and by the backward stagger of the wings. The banjolike levers on the leading edge of each lower wing indicate that the designer has aimed at a measure of automatic lateral stability.

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¶To help stabilize foreign exchange, a form of international currency is suggested by delegates to an international trade conference, held in Atlantic City.

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**Unusual Basement Features That Make a Los Angeles Department Store Attractive: The Large View Gives a General Layout of the Whole Deparment, Which is Devoted to Sporting Goods, Camping Equipment, Clothing; and the Small Inserted Views Show the "English Shop," for Displaying Imported Clothing; the "Log Cabin," Which Serves as an Outing Information Bureau, and the Soundproof Rifle Range, Used for Testing the Arms and Ammunition Sold to Customers. In One Corner Is the Automobile Elevator**

## BASEMENT SPORTING STORE HAS ODD FEATURES

A rifle range, aquaria containing native trout, a log-cabin bureau of resort information, and a projecting room for movies of a sporting flavor, are among the novel trade-getting attractions just installed in the basement of a Los Angeles department store. This subterranean bazaar is given over to the sporting-goods section, and entrance to it is made inviting by a stairway of exceptional width and easy descent, which opens at the front of the store. Customers in autos, however, may make a more spectacular entrance, for a big elevator carries them, car and all, down to the basement level.

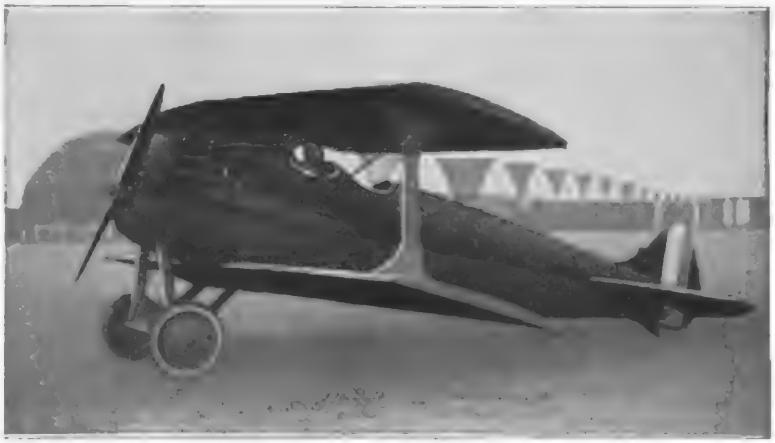
The shooting gallery is attached to the gun department, and is used for testing rifles, but the tanks with their five species of trout, the cabin with its answers to all outing questions, and the movie hall with its educational pictures and lectures, all are features of general service. They emphasize the effort to make the basement department even more attractive to a high-class trade than the levels generally preferred. A luxurious lounge is another service feature whose usefulness is increased by a stock of books likely to interest the customers of the department. The method of displaying an imported line of sportsmen's clothing is also unusual. A section of the basement is fitted up as an old English shop, complete with its gabled roof.

## PLAN CANAL UNDER JERUSALEM TO IRRIGATE HOLY LAND

If the proposals of a Norwegian engineer are carried out, there will soon be a subterranean canal directly under the city of Jerusalem, carrying water from the Mediterranean to the Dead Sea, irrigating the wilderness of Judea, and providing copious electric power at the mouth of the Jordan. For the Dead Sea, that strange body of heavy saline water, is 1,292 ft. below the level of the Mediterranean, and not more than 50 miles away. The unnatural direction of the drop will have no effect on the practicability of the plan, and the waters of the big sea to the west, entering through canal and pipes, will help the inadequate Jordan to freshen the contents of the basin, in whose vast depths the mineral and biological scavengings of the whole valley have been trapped and concentrated for thousands of years, with no possible escape. An ample electrical supply, available for the modernizing of the Holy City and other communities that have made no progress since their names were recorded in the manuscripts of the Bible, is an interesting prospect. But more important still is the promise that great areas of land, barren since history began, may be made to blossom forth for the support of an always needy population.

## IMPROVED SPAD FLIES BETTER THAN THREE MILES A MINUTE

With the aid of wind or gravity, airplanes have in the past attained a speed of 180 miles an hour; but to a French Spad, powered by a 300-hp. Hispano-Suiza engine, goes the distinction of traveling at that rate under normal conditions and official supervision. The record flight was made several weeks ago at an altitude of 2,000 ft., and near the town of Villa Coublay, France, by M. Sadi Lecointe, famous tester of war machines.



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**A Speed of 184 Miles an Hour Is the Record Recently Hung Up by This Improved Spad. The Simple Wing Bracing, Thorough Streamlining, and Featherweight Monocoque Fuselage Are All Features of Refinement**

¶To promote the "ship-by-truck" idea, an industrial parade was held in Brooklyn a short time ago in which more than 2,500 motor trucks appeared, many of them prepared as elaborate floats. The parade lasted two hours.

***Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.***

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## PNEUMATIC-TOOL SUSPENDER TESTED BY SHIPBUILDERS

Intended to suspend heavy pneumatic tools in convenient positions on perpendicular surfaces, such as the sides and bulkheads of steel vessels, thereby relieving workmen of a tiresome task, a device is being tested in an English shipyard. A two-wheeled carriage runs on a horizontal steel track, which is held in place by brackets designed to be thrust into rivet holes. Attached to the carriage underneath are two pulleys, over which a rope is passed. At one end of the rope a tool is fastened, while at the other is a counterbalancing weight. The contrivance allows the manipulator to devote all of his energy to guiding the tool.

## SWEDISH DRY DOCK ON LAND ABOVE WATER LEVEL

A dry dock now in process of construction by a lumber concern at Ljusne, Sweden, to accommodate its own freight carriers, is remarkable for the fact that it is not in the water at all, but is high and dry on land, above sea level. It is 328 ft. long, and accommodates vessels of 4,000 dead-weight tons, which will enter it by means of a lock, fed by a water-power canal from the Ljusne River. By the same means the dry dock can be filled with water, and emptied by gravity, without any use of pumps. The cost of docking will thus be greatly reduced.

## ENORMOUS LOGS TRANSPORTED ON MOTOR-TRUCK TRAILERS

Placed on sturdy motor-truck trailers, built especially for that purpose, huge fir logs are hauled through the streets of a northwestern lumber town from the terminus of a narrow-gauge railroad, which penetrates the woods, to a sawmill not far away. Quite frequently the great sections are 10 ft. in diameter. Their weight is tremendous. The trailers are constructed to facilitate loading and unloading by a small crew of men.

**Carrying a Great Fir Log to the Sawmill: This Section of a Tree Trunk Is a Heavy Load, Even for the Powerful Motor Truck That Pulls the Strongly Constructed Trailer on Which It is Borne**

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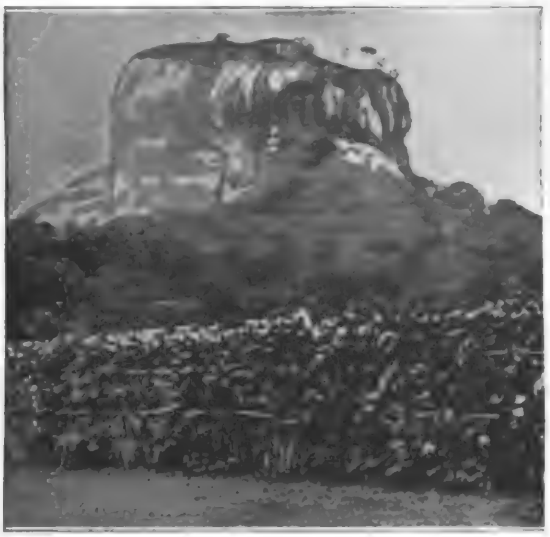
# HUGE ROCK PILLAR IN CEYLON IS OLD FORTRESS

MONUMENT to a murderer's guilt, Sigiri Rock abruptly lifts its solitary head hundreds of feet above a jungle-matted plain in central Ceylon. Traveling from the coast, one is impressed, while miles away, by this towering pillar of granite whose sides rise perpendicular until they swell to a bulging crown. Coming closer, one is surprised to see a parapet coil upward from the tree-hid base to the distant top.



On the Sides and Top of This Granite Pillar in Central Ceylon Still Exist Remains of Defensive Works and Houses Built in the Fifth Century, A. D., for a Fugitive King and His Court

One then recalls one of the most tragic episodes in Ceylonese history, and knows that he faces Sigiri, the ancient inland Gibraltar, upon whose inaccessible summit cowered Kasyapa, the parricide, from 477 till 495 A. D. For it is written that old Dhatu Sena, the father, ruled wisely the prosperous isle till his death at the hands of this second son. The infuriated populace looked with hatred on their new ruler; while Mugallana, the crown prince, fled across the narrow sea to India, where he raised an army to reclaim his heritage. So the slayer grew afraid in his ill-fortified capital city of Anuradha-pura, and one day ordered his engineers to cut a roadway up the unscaled sides of Sigiri, to erect on the top a palatial refuge for himself and his train, and to fortify the whole.

The feat would be difficult today; what labor it must have been for these early craftsmen, imagination can only suggest. It is known, however, that wooden wedges, forced into every accessible crevice, were largely used to burst away the solid granite. In this fashion the circling gallery was hewn from the overhanging rock, was later surfaced with brick and limestone slabs, and finally protected by a high brick parapet that often found

PHOTOS BY FRANK BURNETT

Fourteen Centuries Ago Kasyapa's Engineers Hewed Out This Broad Pathway to the Top of Sigiri Rock. Their Achievement is Appreciated, However, Only When It is Known That the Tools Chiefly Employed Were the Hammer and the Wooden Wedge



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Recently Uncovered by Archæologists, the Winding Pathway is Seen to Consist of Solid Brickwork Covered by Close-Fitting Limestone Slabs

a footing only on some projecting ledge, many feet below. Near the top, defensive gates of metal were hung between the outstretched paws of a gigantic brickwork lion.

And the wonder of it is that the broad stairway may still be used for the climb to the summit. Only the lion and the brickwork of the southwest face have been vanquished by the yearly monsoons of 14 centuries.

Reaching the top, Kasyapa's retreat is found to be unbelievably spacious, containing, in fact, five and a half acres of inhabitable surface. Here are seen well-ordered terraces where once stood the homes of the courtiers; the throne-room floor, still flat and smooth as a billiard table, and, most interesting of all, the remains of a great brick reservoir, or tank, in which was caught every drop of rain-water from every roof in the aerie city.

For these few brief years the summit was the scene of busy, crowded life. Though virtually a fugitive, the murderer still ruled his isle as king; so kept by him his many followers. All these lived upon the pillar's top; the chronicles show that some were actually forced to extend beams over the dizzy edge, and upon them perch their homes.

The Rectangular Opening in the Rock at the Left is Called by Legend the "Bath of Kasyapa's Queen." Whatever It may have Been, It is Still Approached by a Flight of Narrow Steps. Beyond, to the Right, Lies the Level Floor of the Spacious Throne Room

Like Sailors Becalmed in a Ship at Sea, the Inhabitants of the Strange Capital Hoarded Every Drop of Rain That Fell from the Sky. A Gutter Led from Each Roof to This Brick Reservoir, Where the Vital Fluid was Conserved against Future Periods of Drought. Incidentally, as the Island Has No Rivers of Great Volume, and Not One Inland Lake, the Ceylonese have Always Been Expert Builders of These Reservoirs

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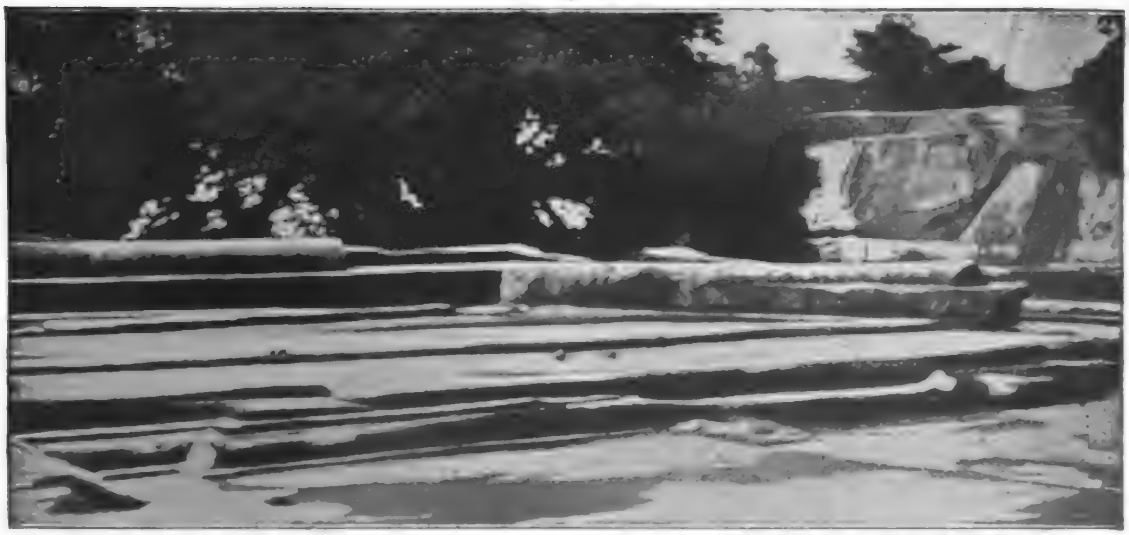

The Throne-Room Floor, Seen beyond the "Queen's Bath" on the Opposite Page, is Here Shown in Greater Detail. Grass and Trees in Every Crevice Now Replace the Structures That Rose 1,400 Years Ago from the Granite Surface, Yet This Smooth Floor Remains. The Imagination can But Feebly Suggest the Infinite Labor Which must have been Required of the Builders as They Chipped Away the Solid Rock

In the year 495, on the plain below, the guilty king was killed; silence again engulfed the lonely rock; and since that day it has stood almost undisturbed, and little known to history as one of the world's great natural fortresses.

## MOST POWERFUL TANKS BUILT AT AMERICAN ARSENAL

The largest and most powerful war tanks ever built by any government are now under construction at the Rock Island arsenal of the U. S. Army. Each is driven by a Liberty motor at an average cruising speed of seven miles an hour. Every member of the crew, which consists of one officer and 10 men, must be a motor mechanic, a machine gunner, and an expert with the six-pound rifle. Campaigning in the new tanks will not be as fatiguing as in the old, however, as the improvements include a self-starter, electric lights for the interior, and a compartment which is separated from the motor and ventilated by forced draft. Worth mention, also, is the proposal that the exhaust manifold of each tank be equipped with apparatus for generating a smoke barrage at will. Thus the tank might screen itself, or unite with others to hide the advance of the infantry.

## TWO CARS USE SINGLE DOOR IN L-SHAPED GARAGE

A two-car private garage in Chicago is enabled, by an ingenious patented arrangement, to accommodate both of its occupants with a single door of ordinary size, without any confusion or maneuvering. The garage building is L-shaped, and the door cuts across the corner of the "L" at a 45° angle. Either car may thus be driven straight into its particular side, or out again, without interfering with the other.

L-Shaped Garage for Two Cars, Which may be Driven In and Out through the Single Door without Interference: The Door is Set at a 45-Degree Angle across the Corner of the "L"

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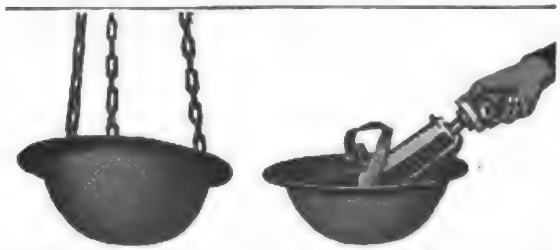
## SOLDIER'S HELMET CONVERTED INTO LIGHTING FIXTURE

The "tin hat" presented by the grateful government to every returning fighting man is sometimes a cumbersome souvenir. It can't be pasted in the family album, and it looks out of place on the parlor mantel. It does make a satisfactory indirect-lighting fixture, however, when equipped with several accessories now on the market. To effect the transformation, a silvered reflector is fitted inside the crown. The helmet is then inverted and suspended from the ceiling by three khaki-colored chains. The socket in the reflector will hold the conventional 75, 100, or 150-watt lamp. The equipment is made only for the American helmet.



The American Soldier's Helmet Makes a Presentable Lighting Fixture. The Silvered Reflector is being Inserted at the Right

## CITY OF TWENTY THOUSAND HAS NO MAIL CARRIERS

An unusual city in many respects is Picher, Okla., which has now attained such magnitude that its post office serves between 17,000 and 20,000 persons. Its most peculiar feature is that this same postal service is performed without any letter carriers whatever. A clerk handles the incoming and outgoing mail, one takes care of money orders, two attend the general-delivery windows, and that is all the help the postmaster has. Furthermore, because of a migratory population, the post office really deals with about 50,000 persons a year. Picher is a mining town, and grew up suddenly. The whole city is built on leased land, and there are no sidewalks.

## OIL-BURNING SUBMERSIBLES MAY ALTER BRITISH NAVY

Great Britain's new first sea lord is reported to be convinced that an oil-burning submersible battle cruiser is the warship of the future, and this belief may affect the empire's naval plans. The dreadnaught is thought to have passed the peak of its career, and now to be ready to take second place as a fighting ship.

## PERMANENT MEMORIAL ARCH OVER BUSINESS STREET

Disdaining all such ephemeral, though glittering, "memorial" materials as canvas and plaster, the city of Wichita, Kan., has erected a massive and permanent arch of exceptional design for dedication to its soldiers. The big arch spans the city's main thoroughfare in the heart of the business district, and the substances of its sturdy construction are steel and brick, surfaced with stucco. The names of those who served appear on great tablets, forming the faces of the tower abutments of the arch, and across the top, following the curve of the span, is to be found a legend, reading "For the Liberty of the World."

The Great Victory Memorial Arch That Spans the Main Business Street of Wichita, Kansas: The Span as Seen at the Left is Built of Steel and Brick, Stuccoed, and the Names of Soldiers Appear on Tablets in the End Towers, as at the Right

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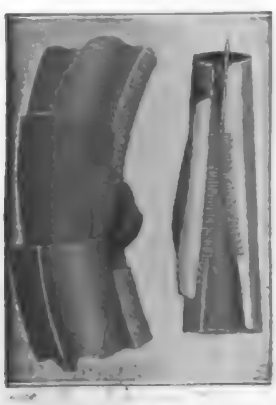
## GERMANS CLAIM TO HAVE HAD WIRELESS-STEERED PLANE

A secret aeronautical development, hitherto guarded jealously by the German war office, has lately come to light through the disclosures of a prominent air-craft manufacturer. He asserts that in 1916 the army authorities asked him to design a very cheap airplane, powered by a very cheap engine, and steered in flight by wireless waves. "Shepherded" by one man in an ordinary airplane, a "flock" of these manless machines was to have been guided over the lines and into France. Once above the target, each little plane was to have dropped its load of explosives at the volition of the "shepherd." Such was the plan. The manufacturer claims that the planes were actually designed, and, had the government not insisted on making them itself, would have won the war for Germany. Not till the summer of 1918, he says, was the construction placed in his hands, with the result that quantity production was imminent when the armistice was signed.

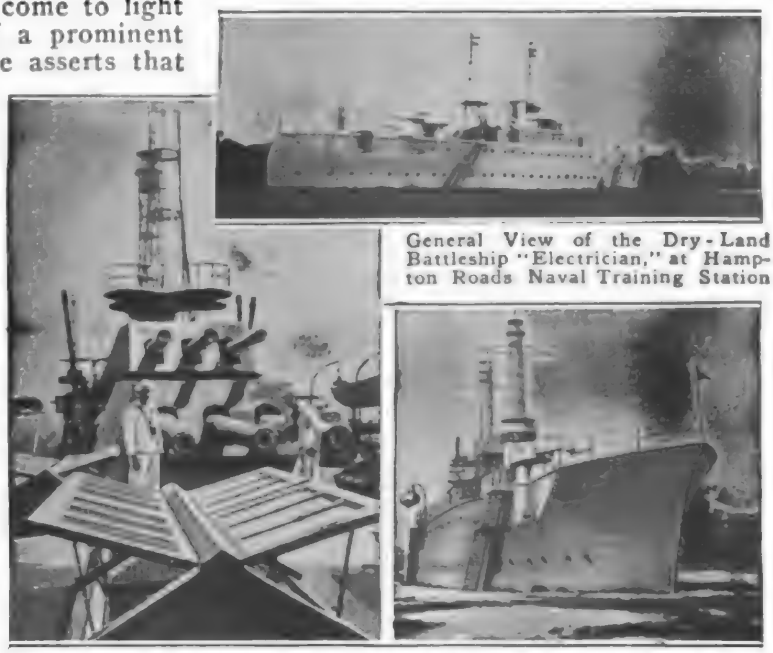
## HOOKS FASTEN BLOW-OUT BOOT AROUND INNER TUBE

Something new in automobile accessories is a pneumatic-tire boot, made of strong fabric, that can be fastened around an inner tube by attaching the numerous small hooks which protrude from its edges to a thin strip of stiff rawhide. An inside flap prevents the hooks from damaging the tube, while another, on the outside, serves to keep the device in position when it is placed between an edge of the casing and the wheel rim.



## NAVAL ELECTRICIANS TRAINED ON DRY-LAND BATTLESHIP

Strangely incongruous is the sight of a gigantic battleship, fully equipped and armed, standing in a field at the Hampton Roads Naval Training Station. Only a close examination will reveal that the craft is made of wood, and that its massive guns are incapable of being fired. The dry-land vessel is an exact copy of the U. S. S. "Mississippi," but has been christened the "Electrician," a name which aptly describes its use. Naval student electricians are trained and quartered on the extraordinary ship, which they board by means of regulation gangway ladders.



General View of the Dry-Land Battleship "Electrician," at Hampton Roads Naval Training Station

**The Dangerous-Looking Guns to be Seen in the Picture at the Left cannot be Fired, as They, Like the Remainder of the Vessel, are Made of Wood. On the Right are Shown the Gangway Ladders Used for Boarding the Ship**

## NEW YORK STATE BOYS START MILITARY TRAINING

Boys of New York State from 16 to 18 years old, over 100,000 of them, have now been called to classes in all parts of the commonwealth by the State Military Training Commission. All the subjects that go into the making of good citizens will be taught them by officers of the regular army and national guard, as well as by physical instructors and teachers from colleges. Use of small arms, camping, first aid, and vocational direction are among the interesting studies included in the course.

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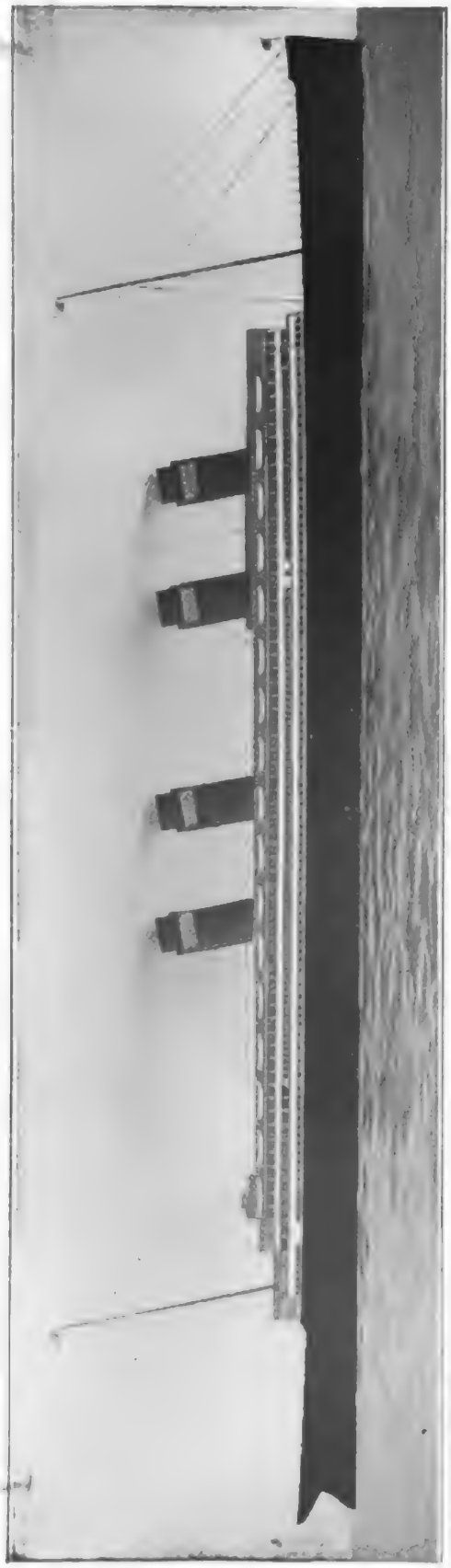

PHOTO BY WIDE WORLD PHOTOS

Type of 1,000-Foot Passenger Ship of Which Two are About to be Built for the Transatlantic Service by the United States Shipping Board: Each Ship Has 10 Decks, and is Equipped with Oil-Burning Engines for a Speed of 30 Miles an Hour, and at This Rate It is Calculated That They will Make the Trip across the Atlantic Ocean in Four Days

## TWO GIANT TEN-DECK LINERS FOR AMERICAN SERVICE

Work is to be started immediately on the construction of two new American liners by the U. S. Shipping Board, each vessel to be 1,000 ft. long and to have 10 decks. They are intended for the transatlantic passenger service. Oil-burning power plants will be installed, calculated to drive the big ships at a speed of 30 miles an hour, which is expected to reduce the duration of the trip across the ocean to four days.

## SEVENTY CENTURIES IS AGE OF SINAI INSCRIPTIONS

Older by thousands of years than the tablets of Moses, certain inscriptions in sandstone at the Magharah mines, on the Sinai Peninsula, have finally convinced modern investigators that the product of these ancient workings was not copper, as supposed, but turquoise. A considerable amount of quasi history has been built around the cuprous tradition, and American mining engineers, never satisfied with home-grown riches, have threaded the Arabian desert with eager plans for restoring the lost industry of old Egypt. Copper they found, to be sure, and signs of ancient workings; but an ore of such poverty that only the classification of copper as practically a precious metal could have warranted its reduction.

Without question the most marvelous product of those mines of antiquity is their inscriptions. The tablets, one of which measures 102 by 63 in., are carved in relief, with remarkable character, on sandstone, whose seemingly perishable nature has withstood the erosions of time since 4950 B. C.—some 3,700 years before Moses' day, and nearly 7,000 years before this 20th century. Many valuable specimens have been destroyed by vandalic prospecting, but those remaining are now in the care of the Cairo museum.

## MOUNTAINEERING IN A TANK LATEST EUROPEAN SPORT

No thought of contributing to the gayety of peaceful pastimes cheered the designer of the military tank. But pleasure is resourceful and daring, and now, in the French Alpine country, whole busloads of excited passengers are to be seen scaling mountain trails hitherto inaccessible to any vehicle, mounted on the extemporized seats of a regular army tank.

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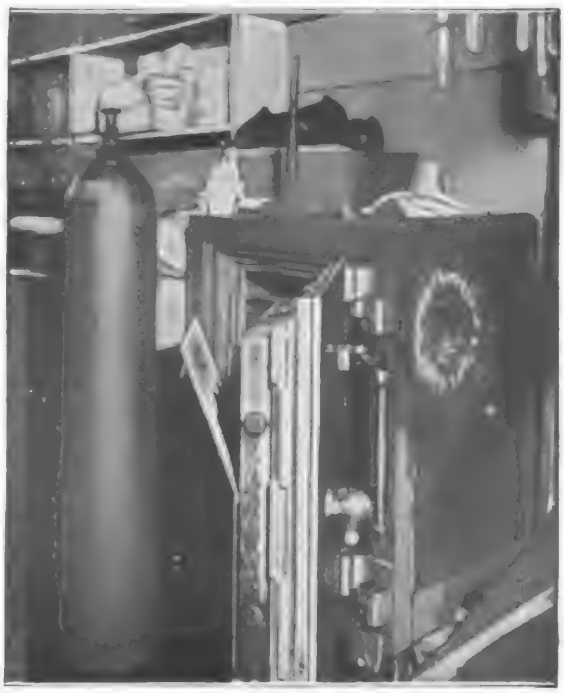
Army Tank Fitted with Seats for Ten Passengers, Now being Used for Mountain Climbing in the Alpine Districts of Eastern France: Paths Hitherto Impassable are Thus Made Available, and Mountain Hotels are Using Them for Busses

The smaller machines of this type are readily equipped with seats, either lengthwise or tranverse, for a total of ten passengers, who enjoy all the thrills of amusement-park ingenuity, with the advantage of progress toward their destination.

## YEGGMEN BURN HOLE IN SAFE WITH ACETYLENE TORCH

Arriving at his office on a recent Monday morning, a Cincinnati business man was greeted by two open safes, the locks shattered from within by explosives, one side of each still hot to the touch and pierced by a yawning hole. By the larger safe, which on Saturday night had been locked upon many thousands of dollars, now stood two emptied gas tanks, each four feet high, and telling the story of the yeggmen's methods. Working for many hours, they had burned a hole through the side of each safe, then exploded a charge of nitroglycerin under each lock, and swung open the heavy doors. The smaller safe was rifled, but the many thousand dollars in the larger were found intact in an interior strong box whose lining of manganese steel had resisted the flames.



Having Burned a Hole through the Side with Acetylene Gas, the Robbers Found It Easy to Shatter the Time Lock and Open the Door

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## ANCIENT AND COSTLY ARMOR DISPLAYED IN MUSEUM

Fashioned nearly four centuries ago, an elaborately carved and heavily gilded suit of armor now on exhibition in an eastern museum is declared to be the most valuable production of its kind in existence. It was made

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**In the Sixteenth Century This Beautiful Carved and Gilded Armor was Worn by a French Warrior. It is Now to be Seen in an Eastern Museum**

for a French knight in 1527, and was brought to this country by a famous American collector, who discovered it in Paris several years ago. Recently it was presented to the museum. Included in the outfit are trappings for a horse, embellished in the same manner as the suit, and affording protection for the beast as well as its rider.

## AIR CRAFT TO LINK NORTHERN CANADA WITH SOUTHERN PORTS

In the projected commercial development of that virgin part of Canada which lies between Hudson Bay and the coast of Labrador the airplane and the dirigible, it is now learned, are to play the stellar rôles by carrying freight to and from the outposts of industry. The cost of such a service will be considerable, yet small in comparison with the present rate of $2 and more a pound, necessitated by the use of canoes and dog teams. During the coming year the main operations will be carried on in the region which lies north of the mouth of the St. Lawrence River. Already the scheme is arousing much interest in the city of Quebec, which will, of course, profit directly by any developments.

## FANCY GOLDFISH MARKED IN RED, WHITE, AND BLUE

The collecting and breeding of fancy goldfish by the many people who make it their "hobby" has never produced a more brilliant result than "Miss Liberty," noted during the last few months as the fish whose progeny are being sold to raise funds for a city aquarium. "Miss Liberty" numbers among her immediate ancestors a Chinese moor-black, a red-scaled Japanese, and a brown transparent-scaled Japanese goldfish, and accounts in this way for her own strange appearance. The under body is red, the back white, while the fantastic markings on fins and body are blue.

## PRECAST CONCRETE ROOF FITS TOGETHER LIKE PUZZLE

Finding it impossible to build the superstructure of Pier No. 6 at Cristobal of steel as planned, the authorities of the Canal Zone caused it to be redesigned as a concrete shed. An unusual precast-roof construction is the result. The heavy, monolithic supporting columns were cast in place, but the girders and roofing tiles were all cast elsewhere. Slots in the supporting columns received the main girders, while slots in these received the secondary girders. As a consequence the only metal on the pier is

**The Roof of This Great Pier in the Panama Canal Zone is Seen to Consist of Concrete Girders Which Fit into Slots in the Concrete Columns. The Whole is Covered by Concrete Tiles**

found in certain protective buttresses, in the reinforcing rods, and in the rolling doors.

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# COMFORTABLE HOME IS BUILT ON TRUCK CHASSIS

Looking Forward in the Motor Truck's Luxurious "Living Room," toward the Driver's Swivel Chair

The Comfortable Couch Bed in the Rear and the Ample Cupboards and Dressers Are Visible Here

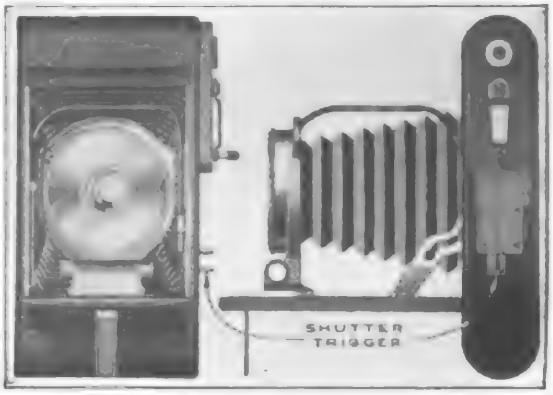
PHOTOS COPYRIGHT, MR. AND MRS. A. N. NEAL

**The External Appearance of the Traveling Home, Showing How the Living Apartment is Substitued for a Motor-Truck Body: The Entrance Doors Are at the Forward Corners, and the Body Is Metal-Covered**

The idea of substituting a small living apartment for the conventional automobile body has been worked out in many ways, but most of them are merely makeshifts, intended to take the rough edges from camp life. A California designer, however, has evolved a nomadic dwelling that is not only comfortable but even luxurious. An oak frame, 14 ft. 5 in. long and 7 ft. 1 in. wide, covered outside with metal and inside with wallboard, is mounted on a 1½-ton chassis. It provides a living room of good size, with a cross-beamed ceiling, and doors at the front corners. A clever arrangement of cabinets transforms the apartment into bedroom or kitchen at will. A tire pump is used to supply water for the lavatory and fuel for the cookstove. Tanks and cupboards carry all necessary supplies, permitting an indefinite stay wherever the fancy of the occupants may dictate.

# REPEATING CAMERA TAKES NO "DOUBLES" OR "BLANKS"

Consecutive exposures may be made very rapidly with a new hand camera, the patent for which is assigned to a large manufacturer. The film is wound with a crank after each exposure, exactly the right length of winding being assured by an automatic stop, which advances one step after each operation, to compensate for the growing diameter of the film spool. The shutter trigger is located on the side of the case, and connected with the winding mechanism by a sliding plate, which locks it after an exposure, but releases it again as soon as the exposed film has been wound. The shutter trigger then, in turn, locks the winding mechanism until another exposure has been made.




**Front and Side Views, Respectively, of the New Repeating Camera: The Winding Crank and the Small Compartment Which Contains Its Mechanism, as Well as the Shutter Trigger, are Seen in Both Views**

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## FORTY CHESS PLAYERS PITTED AGAINST EXPERT AT GAME

Chess ordinarily requires the utmost mental concentration on the part of the players, but this rule does not apply in the case of an expert who appeared at a tournament held recently in England. Forty skilled opponents, seated at as many boards, were engaged at one time by this master of the game, who went from problem to problem with remarkable speed, studying each but a moment before deciding upon a strategic move that left the antagonist in a quandary. Only lack of room prevented the expert from playing 50 persons, as had been planned.

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**Dividing His Attention between 40 Chessboards, and a Like Number of Players, the Expert in the Center of the Picture Proved Himself Master of All the Problems Presented**

## PLANS MADE FOR AIRPLANE FLIGHT TO SOUTH POLE

Plans are formulating fast for the airplane dash to the South Pole which is to feature the five-year cruise of the British Imperial Antarctic Expedition, scheduled to start in June, 1920. First will be established a land base about 750 miles north of the pole. Here the airplane will be loaded with a sled, for use in case the plane breaks down, with provisions, and with every drop of gasoline the tanks will carry. Aside from these plans it is announced that applications from scientists are now invited, as it is desired to "sign up" the full party of 51 men as quickly as possible. Among those whose applications have been rejected are many women and a number of boy scouts.

## CONCRETE MADE WITH CINDERS USED TO BUILD HOUSES

Urgently in need of dwellings to shelter workmen employed in a chemical plant near Wilmington, Del., government engineers constructed a village of 75 inexpensive fireproof houses in a very short time and in a novel way by utilizing cinders removed from the factory furnaces. This material was mixed with cement and hydrated lime, producing concrete of unusual strength. Movable steel molds were used in erecting most of the buildings, these being found more economical than ordinary wooden forms, as they could be transferred to new positions as quickly as the material set. Stones were imbedded in the walls, reducing the cost of the structures by displacing a large quantity of concrete. Finished with a coating of white stucco, the buildings presented an attractive appearance.

## FREIGHT-CAR DOOR IS OPENED EASILY BY NEW ATTACHMENT

Opening freight-car doors of the usual sliding type is generally a serious task, demanding tools and muscle. An attachment for such doors, recently devised by a railroad man, so far relieves this condition, however, that a child is able successfully to operate it. The device

BY COURTESY OF THE SANTA FE

**Freight-Car Door Opener, an Attachment Makes the Usually Difficult Task E... Even for a Child**

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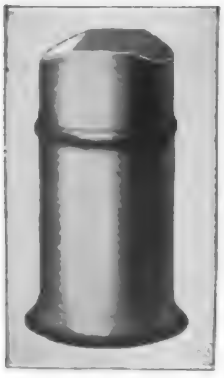
Floating Hotel on Great Central Lake, British Columbia: Fishermen and Hunters Who Patronize the House Boat Find It an Ideal Temporary Home, as the Proprietor Moves the Craft to Any Location That Offers the Best Sport

consists simply of an iron bar pivoted above the door, with a handle on its lower end. The point where the bar engages the door in opening or closing it, gives the user a leverage that overcomes the most stubborn resistance.

## ALUMINUM STAMP MOISTENER HAS PERFORATED CAP

For moistening gummed stamps, envelope flaps, and labels, a simple device, made entirely of aluminum, has been placed on the market. It consists of a small cylindrical water container, fitted with a finely perforated cap. When the container is turned upside down and the cap applied to a smooth surface, liquid flows through the tiny holes. The contrivance is intended to serve instead of moist sponges and other makeshifts now in common use.

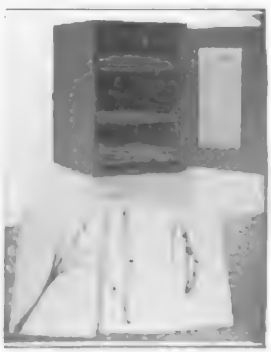


## SPORTSMEN'S HOTEL FLOATS ON CANADIAN LAKE

Unable to purchase a convenient site on shore, a Canadian operates a floating hotel on Great Central Lake, B. C., a body of water noted as a fishing and hunting resort, and wins the approbation of patrons by moving the quarters to any spot that affords the best sport. There are 10 guest rooms on board the big house boat, each capable of accommodating two persons; a large dining room, and a kitchen. Around the structure is a wide veranda, from which perch can be taken with a hook and line, if the craft is advantageously moored. Trout are plentiful, but require a little more effort to capture. Wild game abounds in the woods which surround the lake. During the winter, when ice covers the water, the proprietor of the hotel becomes a fur trapper.

## FOREST RANGERS COLLECT PLANT SPECIMENS

Equipped with small herbariums, the forest rangers on their tours of one western district will henceforth gather specimens of all plant species encountered. Turned in at supervisors' headquarters, these will be mounted and described for public reference. Stockmen using the national forest ranges may become familiar in this way with all the forage plants in the region, and will be able to guide their grazing herds away from areas infested with poisonous weeds.



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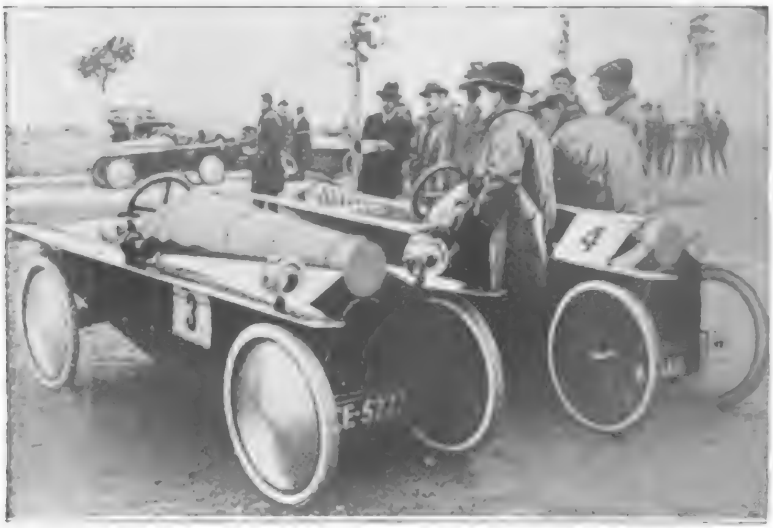
## ENGLISH LIGHT-AUTO CRAZE BRINGS OUT ODD MODELS

Whether the reason be psychological or economical, there is no doubt that the ultra-light auto is finding a warm welcome just now in England—the lighter the warmer, it would seem. To offset the inconspicuousness of the very small car, there is considerable departure from conventional lines in the models displayed, whose designs are more easily pictured than described.



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**Some Models of Very Light Cars Now Popular in England, Indicating a Tendency to Gain by Oddity What Conspicuousness is Lost by Diminutive Dimensions**

## CHAIR OF DIPLOMACY PLANNED FOR PRINCETON UNIVERSITY

Significant indications of America's expanding world interests are found in several details of the proposed $14,000,000 endowment program of Princeton University. Of first interest is the plan for the establishment of a chair of diplomacy, which, it is believed, will increase the number of men willing and qualified to give intelligent, disinterested service as America's representatives in foreign countries. Important also is the proposal to create a department of South American history and institutions, which should prove itself invaluable in fostering sympathetic coöperation between the two countries.

¶"The World War" is now the official American designation of the recent international disagreement, instructions to that effect having been issued to the War Department by the President.

## UNUSUAL BOILER CORROSION RESULTS FROM COKE FUEL

A peculiar chemical action, resulting in the corrosion of all parts of a boiler exposed to the fuel gases, was discovered in a recent inspection of an English steam plant using coke fuel. In places the boiler plates were reduced from 7/16 to 3/16 in. thick, and were coated with a pale-reddish scale, which was found to consist of dehydrated sulphate of iron and red oxide of iron. Further research brought out the fact that sulphur-dioxide gas released from burning coke, passed over heated red oxide of iron, is converted into sulphur trioxide, which becomes sulphuric acid when mixed with water. Allowing the boiler to cool had condensed moisture in the hygroscopic iron oxide, and the acid formed had reacted upon the iron of the plates.

## SHOES OF RECORD SIZE COVER FEET OF CIRCUS WOMAN

The soaring price of shoes interests many million people; but to one woman nature has made it a matter of most particular concern. So large that she is exhibited by a circus as a side-show freak, her feet require for covering shoes of unusual proportions. Each is 19½ in. long and 8½ in. wide, and contains almost three times as much leather as the ordinary man's shoe. In appearance they resemble the latter, however, no attempt being made at fashion.

**The Shoes in the Center, of Ordinary Size, are Dwarfed by the Giants on Right and Left, Which Are Nearly 20 Inches Long and are Worn by a Circus Woman**

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# CAMERA CATCHES BOARS SWARMING FROM JUNGLE

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ALTHOUGH tigers, leopards, wolves, boars, and elephants abound in various parts of India, an Indian relative of the humble American pig is famed among sportsmen everywhere as furnishing the most exciting sport in the world. The wild boar of that country stands 30 to 40 in. high at the shoulder, and distinguishes himself as a swift runner and a desperate fighter when at bay. The sport of hunting him on horseback with light bamboo spears consequently is replete with dangers and thrills, and calls for such good horsemanship and bravery that it has frequently received the support of the military authorities. The sportsmen usually employ long lines of "beaters," under the command of a mounted native, to chase their quarry from its jungle cover; but in the photograph above hundreds of the animals have been caught by an adventuring camera man as they swarmed from hiding to enjoy themselves at a salt "lick." Their craving for the health-bringing substance thus frees them periodically from their fear of man. Two natives at the right are safely perched on a trap in which they catch an occasional animal for slaughter.



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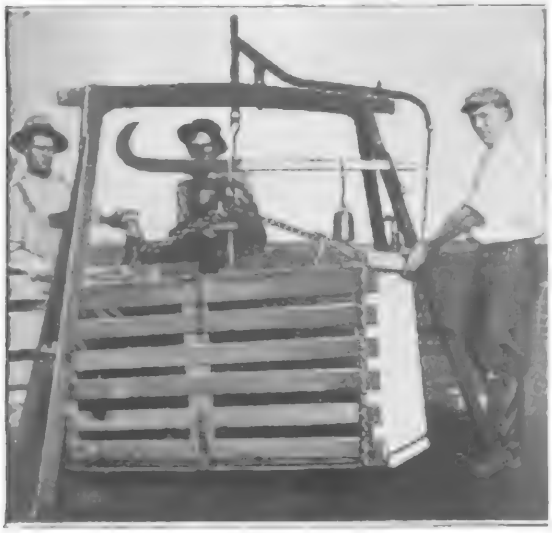
## PORTABLE SCALE EMPLOYED FOR WEIGHING HOGS

By suspending a crate from the hook of a portable scale, designed originally



Weighing Hogs on a Portable Scale: One Side of the Crate is Hinged So That It can be Dropped to Admit the Animals

for use in cotton fields and on docks, the device is rendered suitable for weighing hogs, and has been found a convenience on stock farms where large numbers of these animals are raised. The scale beam is hung on a wooden bar that is supported at either end by two spread legs. This assembly can be carried by two men. Chains are employed to attach the crate, which is constructed so that one of its sides can be dropped to permit the entrance of a hog.

## DANISH MACHINE PRESERVES CREAM FOR EXPORTATION

Cream prepared with a device recently patented in Denmark remains fresh for a long period, and plans are being made to manufacture this product in quantity for exportation from the Scandinavian country, instead of ordinary condensed milk. While a detailed description is not available, it has been revealed that the contrivance atomizes the small particles of fat contained in cream, dividing these into still more minute portions. Material is forced through the machine under high pressure. Several similar devices proved to be costly failures when put into actual operation.

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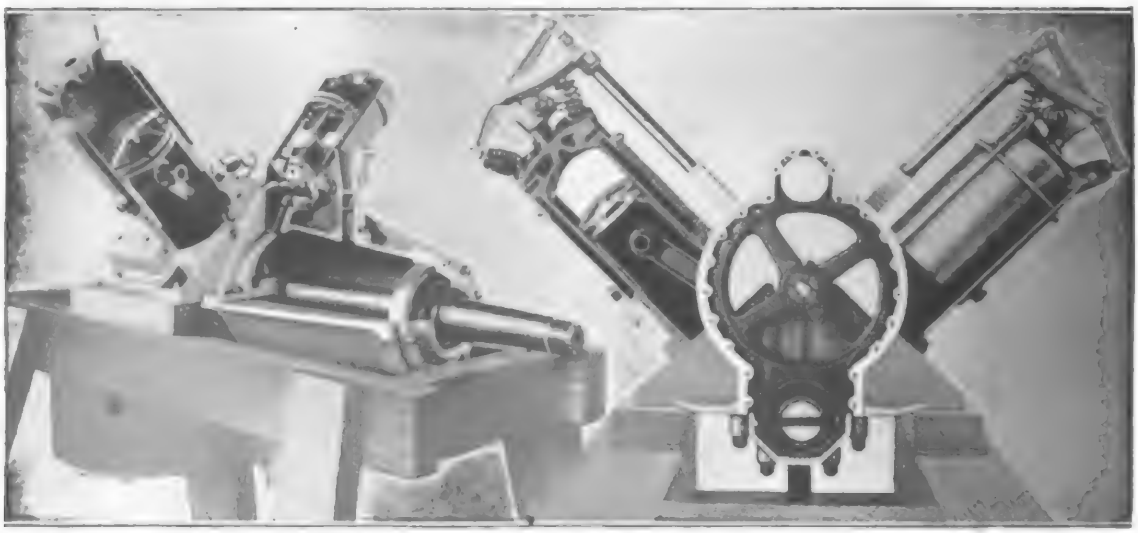
## GAS-ENGINE THEORY LEARNED FROM DISSECTED MODELS

"Dissected" motors are now found useful in expediting the instruction of the army's student airmen in the theory and operation of internal-combustion engines. With a hacksaw enough metal is cut away from these engines to permit the student's inspection of every part. Thus each cylinder is examined in cross section, while the pistons move up and down, and the valves open and close. In studying the oil, gasoline, and water circulation, the student finds their paths colored respectively in red, blue, and white. Convenience in handling these classroom models is obtained by attaching each to its wooden base with stout hinges



These Two Cut-Away Internal-Combustion Engines have Proved Valuable Aids in the Instruction of Student Airmen. The Oiling System and the Mounting of the Crankshaft are Clearly Understood from the Model at the Left, While at the Right is Demonstrated the Action of Valves and Pistons. The Hinged Bases, Shown Most Clearly at the Right, Make Handling by the Instructor an Easy Matter

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One-Story Building of One-Thickness Tile, Built to House a Fire Sale for a Department Store Which had Lost Its Own Building: It Was in an Oil Town, and No Other Space Was Available. After the Sale of a Few Days the Building was Torn Down

## CONSTRUCT SPECIAL BUILDING FOR FEW DAYS' FIRE SALE

The enterprise and resourcefulness characteristic of the Southwest's mushroom oil towns is not confined to their chief industry. A big department store in a Texas gusher community burned out the other day. Obviously a fire sale was the next thing in order; but the damaged store was unfit for it, and a swarm of oil men had preëmpted the other space in town. On a vacant lot a local contractor, unembarrassed by the scarcity of material and help, then undertook to erect a one-story fireproof building in 50 working hours. In that time he actually delivered a remarkable finished structure of tile, one layer thick, 50 by 100 ft. In this was held so successful a sale that in a few days the building, empty once more, was torn down.

## MOVIE DIRECTOR IN AIRPLANE FINDS LOCATIONS EASILY

An enterprising movie director attached to a California studio used a seaplane the other day as a quick and novel means of inspecting a wrecked Chinese junk. The vessel was found to fit its name too well for picture work; but the movie man declares he has found the ideal way of hunting locations, and has some aerial snapshots to prove it.

## NO PAGES TO TURN WITH USE OF MOTOR-MOVED MUSIC ROLL

Stopping to turn a stubborn page, the musician not infrequently finds the effect of his performance spoiled by an awkward pause. From France now comes an invention which will obviate this annoyance. The music is printed, not on pages, but on a long strip, as is the practice with music for the player piano.

COPYRIGHT, KEYSTONE VIEW CO.

The Little Lever Controls the Speed at Which the Motor-Driven Rolls Bear the Music before the Eyes of the Musician

Placed on motor-driven rolls, the music passes before the eyes of the player at any desired speed. The controlling lever is conveniently placed at one side.

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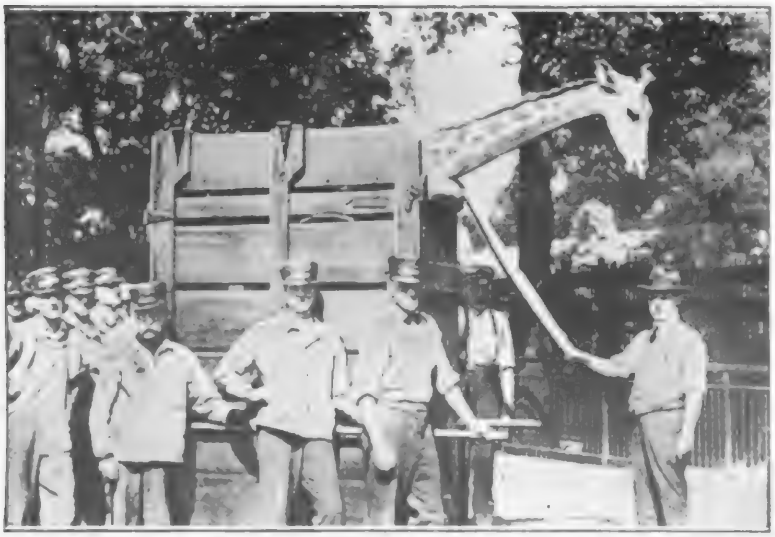
## STUBBORN GIRAFFE CARRIED TO WINTER HOME

When it comes to temperament there's not an inhabitant of the Chicago Zoo can hold a candle to "Mollie" the giraffe. All summer long she walks contentedly about her outdoor pen. But with the coming of winter, and the danger that "Mollie" may develop the pneumonia to which she is so susceptible, she suddenly remembers her sex and grows unreasonable. The keepers coax, but she won't budge an inch toward her winter quarters, just 50 yd. away. Each year the keepers try, but yearly they fail. So they have now built a wooden crate with hand grips along the side, and in this palanquin bear the stubborn lady to her winter home. All sharp edges are "upholstered" to prevent injury to the animal.



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**Like an Oriental Lady in Her Palanquin, "Mollie" the Giraffe is Borne Each Year from Her Outdoor Pen to Her Winter Quarters. The Rails along the Sides of the Crate Provide Handholds for a Dozen Keepers**

## MOTORBOAT FOR COMMUTERS RUNS AT AUTO SPEED

Highway speed and more than limousine comfort are afforded those in a position to travel from their country homes to their offices by water, in a new motor cruiser designed with that purpose in view. With its 52-ft. length, its roomy deckhouse forward, comfortable cockpit at the stern, and raised cabin between, this luxurious yacht is stanch enough for the Florida trip in the winter, and for daily commuting the rest of the year. Its two eight-cylinder engines, with a total of 400 hp., give it a speed better than 27 miles an hour, allowing the water commuter at least a 30-mile radius from his business, and increasing the pleasures of vacation cruising in southern waters.

## RAILROAD TIES, SCARCER NOW, TRAVEL IN SPECIAL CARS

Maintenance of railroad ties no longer means merely a little casual lumbering along the right of way. Long hauls are becoming the rule rather than the exception for loads of hewn ties, and one west-

**High-Speed Motor Cruiser Which can be Used for Commuting between Country Home and Business, as It Runs at 27 Miles an Hour: Its Forward Deckhouse, Raised Cabin, and Roomy Cockpit Give It Unusual Comfort**

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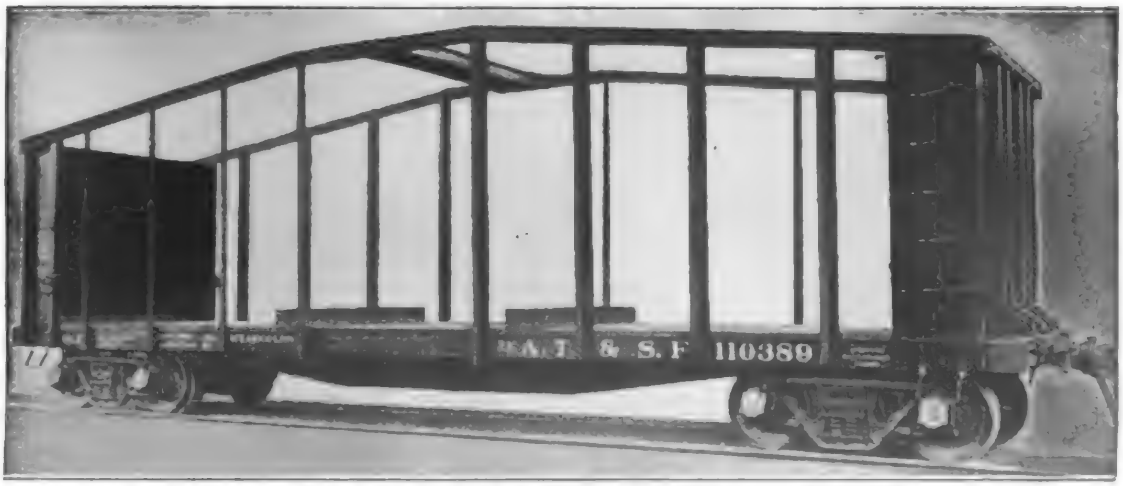
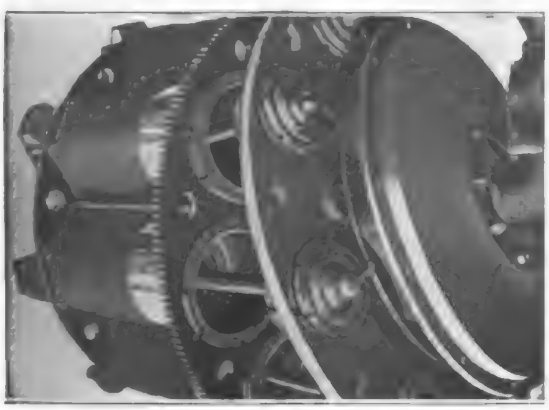



**Special Car for Railroad Ties: Only the Ends are Inclosed, Using One-Fourth-Inch Iron Plate for the Purpose, and the Side Posts and Top Bars Are of Structural Steel. The Car is 40 Feet Long Inside and Nearly 14 Feet High in the Center**

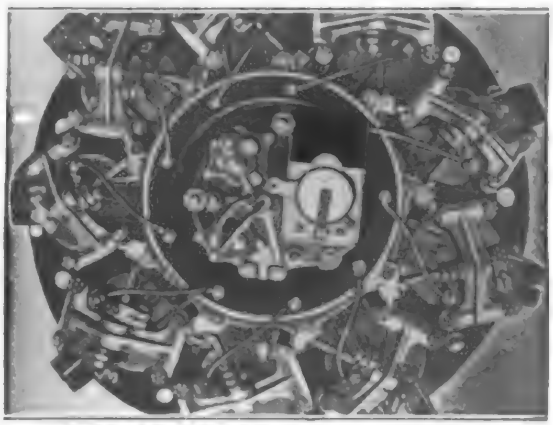
ern road is hauling them in a special car, built for that purpose. It has a platform length of 40 ft., with 12 steel posts at each side, surmounted by longitudinal channel irons, a heavy beam connecting them across the top. The ends are inclosed in ¼-in. iron plates. Four wooden-tie supports, capped with channel iron, project above the floor of the car near center and ends. The car's total height is slightly over 11 ft. 8 in. at the ends and 13 ft. 11 in. at the center.

## TILTED DISK REPLACES CRANKSHAFT IN ROTARY MOTOR

A nine-cylinder rotary motor with connecting rods working in ball-and-socket joints is Italy's latest contribution to the cause of aviation. The cylinders are held side by side by a geared ring which presses upon their flanged ends. The connecting rods terminate in balls which are held by sockets in an oblique, or tilted, disk. At the opposite end of the cylinders are the magnetos, spark plugs, and the usual valves. In operation, the propeller shaft is driven from the geared ring mentioned above. Remarkable accessibility for repairs is gained by the original construction, as the whole thing can be dismounted, pistons taken out, etc., without removing the engine from its bed. Between 300 and 450 hp. is developed at 1,500 revolutions per minute.



**This Unconventional Engine Is of Italian Design and is Meant for Airplane Use. The Connecting Rods Terminate in Ball-and-Socket Joints**



PHOTOS BY COURTESY OF "THE AEROPLANE"

**The Accessibility of Valves, Magneto, and Wiring Is Evident from This View of the Odd Engine. It should be Manufactured Cheaply, as It Is a Lathe Job**

## TELEPHONE LINKS LIGHTHOUSE WITH DISTANT MAINLAND

Novelists and scenario writers have done their work so well that the lighthouse now stands in many minds as the very symbol of loneliness and isolation. In truth, many are placed in lonely spots; and none lonelier than Tillamook Rock, off the coast of Oregon. Here, for three

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decades, the keepers have heard the quiet broken only by the wash of the waves or the occasional hail of the supply boat. Shortly, however, the telephone is to

Up the Steep Side of Lonely Tillamook Rock the Derrick is Pulling the Telephone Cable Which Is to Link the Lighthouse with an Extensive Coastal System

break the long spell of silence. Under the supervision of the coast-guard service, a cable is being laid, and will soon link Tillamook with a general system which is to connect all lighthouses, coast-guard stations, coast-defense stations, and coast cities.

## PLANE "GASSED" BY SERVICE STATION IN CITY STREET

An automobile service station in a western city is now distinguished as the first of its kind to supply gasoline and oil to an airplane. With the tail resting on the tonneau of an automobile, the plane was rolled through the city streets, around corners, and up to the gasoline pump. The wings, of course, had been removed.

## SEND AUTOMATIC FOG SIGNALS BY LIGHTHOUSE WIRELESS

A simple wireless receiving set and direction finder on shipboard, and an automatic radio transmitter for lighthouse equipment, comprise the elements of a new fog-signaling system now under test. The success of the experimental installation in one lighthouse tender and three Chesapeake Bay lighthouses will be followed by the equipment of a number of Atlantic-coast points under the new plan. Signals so transmitted are not only positively reliable, but are independent of the visibility of the signal light.

## PAPER PRINTED IN SHORTHAND FOR CANADIAN INDIANS

As suggested by its name, the "Kamloops Wawa," published in Kamloops, B. C., is one of the queerest newspapers in the world. Some years ago a priest laboring among the Indians of the Fraser River Valley adapted a shorthand system to the native language. Its reception was cordial; hundreds of Indians studied and mastered it. The priest was encouraged to translate part of the Gospels into his sign language; then to issue daily mimeographed bulletins. These were read so eagerly that he had type cast; and, using the presses of a journal in Kamloops, now prints a shorthand "weekly" that boasts a circulation of 3,500, or more. The considerable advertising carried in every issue indicates operation on a sound business basis.

The Aerial Taxi Service Maintained by a Former Army Airman Recently Advertised Itself When the Plane was Hauled through the City Streets to This Automobile Service Station

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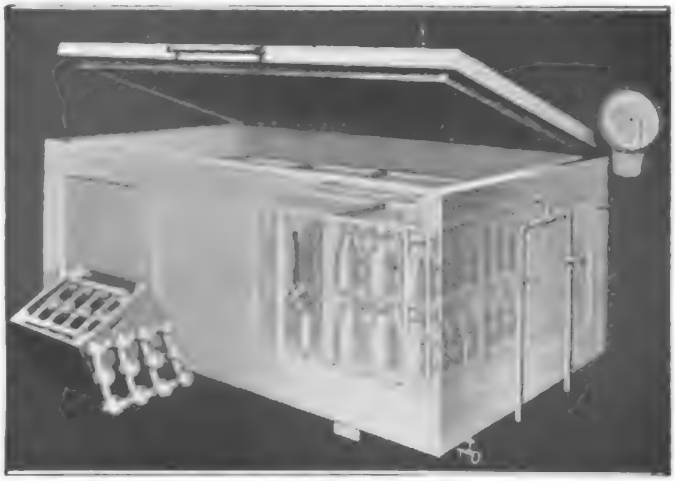
## BOTTLED-MILK PASTEURIZER HAS TRIPLE USE

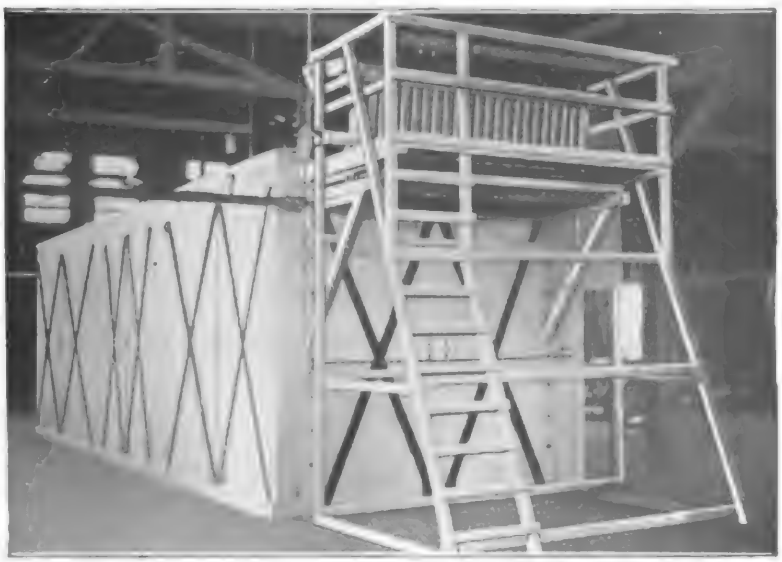
Able to function as sterilizer, pasteurizer, and refrigerator, a new piece of dairy equipment is rapidly finding favor with milk distributors seeking efficiency and economy. Each unit, of which there may be a dozen in a plant, resembles a large box, lidded and amply insulated against loss and absorption of heat. When it is desired to sterilize bottles and milk-handling tools they are placed in the box and bathed in live steam. However, the box is intended primarily as a pasteurizer; that is, is intended to check fermentation in the milk. For this purpose, bottles filled with the raw product are capped with water-tight cuplike covers and stacked in the box. The lid is lowered and locked and steam gradually admitted. The steam being turned off about an hour later, the milk is kept at the same high temperature for another 30 minutes by the heat-retaining properties of the insulation. Finally, to cool the milk, the lid is raised while cool water flows in at the bottom. Rising, this water lifts a blanket of warm water which has condensed from the steam, thus preventing bottle breakage. As the process is now completed the lid is lowered and the milk kept cool until required.



In This "X-Ray View" the New Piece of Dairy Equipment is Shown with the Lid Lifted and the Milk, Bottled and Crated, in Position for Pasteurization. The Covers at the Left Exclude Steam and Water during the Process

## BIG FRUIT-DRYING MACHINE SAVES WASTED PRODUCTS

In the fruit-growing district of Washington State, an inventor familiar with the great waste of unmarketable fruit and vegetables has evolved a dehydrating machine which promises to conserve at least a portion of this valuable food product. The machine is large, intended for factory operation, and performs its functions automatically. It first slices or cubes the fruit, and then spreads it on slightly inclined trays, arranged one above the other in a wood housing. Independent steam control for each tray permits adjustment for different varieties. The rising of the heated air is declared to produce a vacuum effect, which extracts the moisture in a short time, without affecting the cell structure. The product, when cooked, regains its original form and flavor, as the dehydrating process removes from it nothing but water, which the cooking process replaces.



Big Fruit and Vegetable-Dehydrating Machine, Which Cuts the Material into Cubes or Slices and Spreads Them on Inclined Trays Contained in the Frame Housing: Dry Air Rising from Steam Coils Extracts the Moisture

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Grain-Elevator Explosion, Caused by Ignition of Grain Dust: The Violence of the Blast is Indicated by the Wrecked Walls in the Left-Hand Picture, the Débris That Littered the Ground Afterward being Seen at the Right

## COMBINED SCRUBBING MACHINE AND FLOOR POLISHER

Interchangeable brushes and pads supplied with a new light-weight scrubbing machine, intended for household use, make it possible to convert the device into a hardwood-floor polisher within a few seconds. The attachments, circular in shape, are designed to be rotated by a motor, which is mounted on two rubber-tired wheels. A handle of convenient length is provided for pushing the contrivance. Fifty feet of insulated cable, for connecting the appliance with a light socket, is part of the equipment. A switch is located on the handle.

Floors can be Scrubbed or Polished with This Electrically Operated Home-Use Machine

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¶As America's share in the restoration of the Belgian University of Louvain, it is planned to raise by popular subscription the sum of $500,000 for the erection and equipment of a library.

## MILLIONS LOST IN EXPLOSION COSTING THIRTEEN LIVES

The violent explosibility of grain dust, many times demonstrated, was responsible for another tragedy a few weeks ago, when a mammoth grain elevator at Kansas City blew up with terrific force. A total of 13 employes were either killed outright by the blast, or died within a few hours. The elevator contained about 1,000,000 bu. of grain at the time of the explosion, and the loss directly and by the subsequent fire was estimated at three and a half million dollars.

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## GIANT FOREST FIRE BEATEN BY THOUSAND VOLUNTEERS

A forest fire that threatened, in 13 days of unimpeded destruction, to consume the whole of Angeles National Forest, in southern California, was finally brought under control by the desperate efforts of hundreds of volunteers. The unceremonious drafting of curiosity seekers swelled the ranks of the fighters until, in one district alone, around Pomona, more than 1,000 were working day and night to stay the onrushing flames. The kindling of tremendous back fires at critical points, guided by airplane inspection, succeeded in holding the fires within the originating area. Many resorts and summer homes were menaced, but only a few cabins were lost. As a result of the fire, the city waterworks of Pasadena is to be protected by a giant firebreak, which will be constructed immediately by the rangers of the U. S. Forest Service.

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# SENDING WIRELESS MESSAGES BY MACHINE

By SAMUEL W. BEACH

WHILE the submarine telegraph cables will probably for a long time continue to hold the palm for both speed, accuracy, and dependability in the matter of communication between continents, the wireless is now, even though admittedly still open to improvements, rapidly encroaching upon its field.

With "static" interference practically eliminated as a cause of trouble, as recently explained in this magazine, one of the remaining problems in wireless communication was, until a short time ago, a means of transmitting the messages at great speed. With the apparatus shown in the accompanying pictures, which is now in constant use in radio communication between the United States and Europe, the problem seems to have found a practical solution. The dots and dashes it carves out are perfect, which means a lot to the busy receiving operator across the water. If, however, the latter fails to read any of the signals, he has but to step across to his "sending" station with a rush message, which is transmitted instantly, and the office thus notified stops its machine, backs it up to the point indicated, and starts it going again.

Anybody who can peck at a typewriter can keep two or three sending stations working. The messages to be sent are punched into a tape exactly as one manipulates a typewriter excepting, of course, that the letters appear on the tape as a series of holes. The sending machine is so arranged that, as the tape unwinds, it sends out dots and dashes over the radio in conformity with the perforations. This is accomplished by passing the tape between upper and lower contact points which, when coming together, cause an action analogous to the closing of an ordinary telegraph key, the upper perforations starting the signal and the lower ending it. Thus, in the letter "A," which is composed of a dot and a dash, the first lower hole is almost directly below the first upper hole, so that, as the tape moves along, the upper contact will no sooner "close" the radio circuit than the lower comes along and stops it, and the almost instantaneous flash that has been allowed to escape is called a "dot." The upper contacts then come together through the next hole, and as there is quite a distance traveled by the tape before the next lower hole comes along, the flash sent out in the meantime has been of an appreciable duration, and is called a "dash."

There are a number of patented mechanical transmitters, varying only in the means employed to the common end. They can be speeded to any desired number of words per minute; but as a rule a steady jog of approximately 30 words per minute is maintained. However, since this speed is far below the ordinary typist's average, some machines are so arranged that, while the operator manipulates the keyboard at his habitual speed, the tape moves between the contacts at a properly reduced rate.

The Typewriterlike Machine Which Perforates the Transmitting Tape and a Sample of the Latter are Shown at the Left, and at the Right, the Whole Sending Outfit with Magazine Rolls of Tape and Transmitter Proper, the Latter Standing on the Small Table in the Middle

## EXPERIMENTAL BAMBOO GROVE PLANTED IN GEORGIA

Efforts are being made by the Department of Agriculture to interest southern farmers in the growing of bamboo to supply the domestic demand which results in the annual importation of cane stalks worth $5,000,000 from Japan. An experimental grove has been planted in Georgia.

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## GERMAN BABIES' MILK BOTTLES STERILIZED BY MACHINE

Germany, for characteristic reasons, is now giving more than usual care to the rising generation. In the hospital for babies at Berlin, a special machine has been devised for sterilizing the nursing bottles. A large drum revolving in a semicylindrical tank holds a number of bottles at one time, subjecting them all to positive and efficient sterilization.

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**Machine Used in the Hospital for Babies at Berlin, Germany, for Sterilizing Nursing Bottles: A Large Number of Bottles are Sterilized at One Time, with Certainty and Precision**

## CHINESE WOOD-OIL INDUSTRY LACKS MODERN MACHINERY

With more efficient mechanical assistance, the output of wood oil, an important Chinese product in spite of the crude methods employed in its manufacture, could be increased materially, according to an authority who has devoted much time to a study of the subject. The oil is obtained from the seeds of certain deciduous trees that can be grown in practically all parts of the oriental country. Placed in a circular stone trough, the seeds are crushed by a heavy stone roller, moved by native draft animals, such as buffaloes or cows. This pulp is roasted and steamed, then molded into circular cakes, which are subjected to pressure in a primitive hand press. After being heated and strained, the resultant liquid is ready for market. This process extracts oil equal to 40 per cent of the weight of the seeds, though the latter contain 53 per cent. Up-to-date machinery is the chief need of the industry.

## AIR-DRIVEN MINE STOPING DRILL HAS WATER JET

Stoping drills used by miners are usually rotated by hand, automatic rotation being difficult to control in mixed soil or on inclined surfaces. A new form of tool overcomes these difficulties by providing a coil-type brake band, hand-operated, which grips the pneumatic feed piston and instantly retards it whenever desired, the cranklike handle of the brake lever being in the grasp of the operator at all times. Rotation is accomplished by an extension bar on the piston, which has grooves alternately straight and spiral, a ratchet collar allowing a straight blow and rotation on the return stroke. A dust-laying water jet through the drill itself, avoiding the customary deluging of the operator, is another feature. The air exhausts downward through a flange on the drill chuck, which serves to deflect sludge and chips from the operator.

**Self-Rotating Stoper Drill in Use, Drilling an Upwardly Inclined Hole: The Operator's Hand Is on the Brake Lever. The Two Hose Lines Supply Air and Water**

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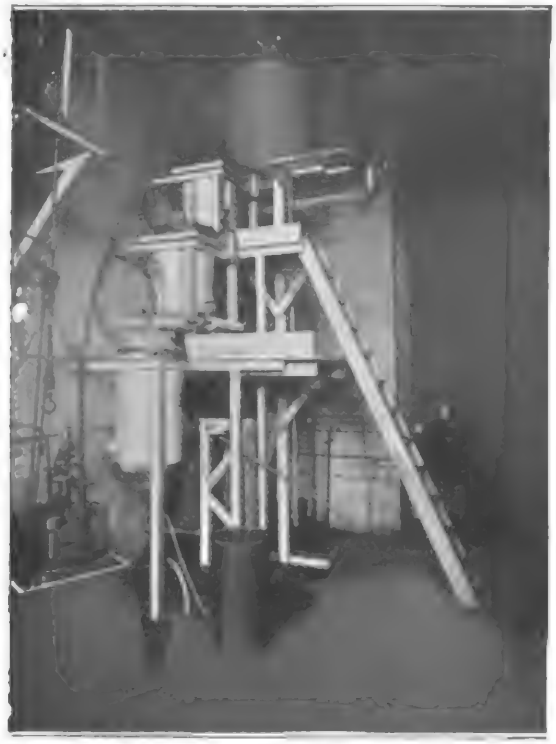
## RECLAIM PARAFFIN AND PULP FROM WAXED-PAPER WASTE

Hygienic air-tight cartons for food and other commodities, and sanitary drinking cups, have enormously increased the production of waxed paper, until the weekly output reaches the figure of 2,400,000 lb., all of which becomes waste. By a system devised by the U. S. Forest Products Laboratory, both the wax and the pulp may now be reclaimed. The waste is placed in a metal cylinder, 3 ft. high and 1½ ft. in diameter, with a quantity of gasoline. A steam coil in the cylinder boils the gasoline, which is fed through a condenser and returned. It is then drained off to recover the wax, and a fresh charge substituted. Final recovery is made by blowing live steam through the cylinder and condensing the vapors, while the pulp residue is turned into the pulp-beating machine, where it begins its reconversion into paper.



Experimental Battery of Cylinders for Reclaiming the Paraffin in Waxed Paper, at the Forest Products Laboratory

Pulp-Beating Machine into Which the Pulp Residue is Turned After the Paraffin has been Completely Removed by Treatment with Steam and Gasoline

## NEW PROCESS AIDS PRODUCERS OF SUGAR AND ALCOHOL

Beet-sugar refineries have been compelled to operate only in sections producing a supply of raw material, and to remain idle between crops, because of the fact that the vegetables utilized require treatment immediately after maturing, under established methods. As a result, the cost of transporting fuel to the factories has been high, since they are seldom located near coal mines, and their activity limited to a brief season. These impediments are declared to have been eliminated by a recently developed process, which extracts nearly 70 per cent of the water contained in the beet roots on the spot where they are grown, and preserves them indefinitely. In dry form, the raw material can be hauled economically, even long distances, thus making possible the location of sugar refineries in coal-producing regions. The desiccated material can be stored, and converted into sugar whenever convenient. With a large supply on hand, a factory can run continuously. The process also can be employed by industrial-alcohol distilleries that use fruits or vegetables of similar composition.

¶So vast is the present store of silver in the United States Treasury that vault walls are bulging out, and part of the building itself threatens to crumble. To meet the emergency the secretary is asking for a new three-story vault building, to cost about $1,500,000.

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Pergola of Rustic Design in the Decorah Park: Logs are Laid across Other Logs Set upon Masonry Columns Which are Built Up of Blocks of Rough Native Limestone, Peculiar for Its Pitted and Eroded Surfaces

# PARK POSSIBILITIES REALIZED IN SMALL TOWN

By AVIS GORDON VESTAL

THE park possibilities of a small town are pleasingly illustrated by the public playground of Decorah, in the extreme northeastern corner of Iowa. The region is rugged and the park site, at the crest of a sharp bluff rising 100 ft. or more above the upper Iowa River, offers an inspiring view across wooded hills and fertile valleys. It is quite accessible, being less than a mile from the business center of the town. An emergency—the imminent sale of this grove of oaks and elms for a cattle-feeding pen—led public-spirited citizens to propose the purchase of the 14-acre plot for a city park. Within a short time $2,500 was collected by popular subscription to secure the land and start its development. More recently an adjoining tract of 18 acres has been donated by one of the city's business men. The landscaping and care of the grounds are in charge of a commissioner who has at his disposal about $1,500 yearly, raised by the municipality through taxation.

The policy of the park's manager is twofold. First, natural effects are retained. Few trees are cut. Patches of underbrush and wild flowers under the denser tree shade are protected from vandalism by fences bordering winding paths. Few bridges are built, though the land is picturesquely diversified by

The Motor-Driveway Entrance to the Park is Flanked by Massive Square Pillars of the Same Limestone, Each Surmounted by Graceful Electric-Light Fixtures. Similar Pillars Mark Other Entrances to the Park



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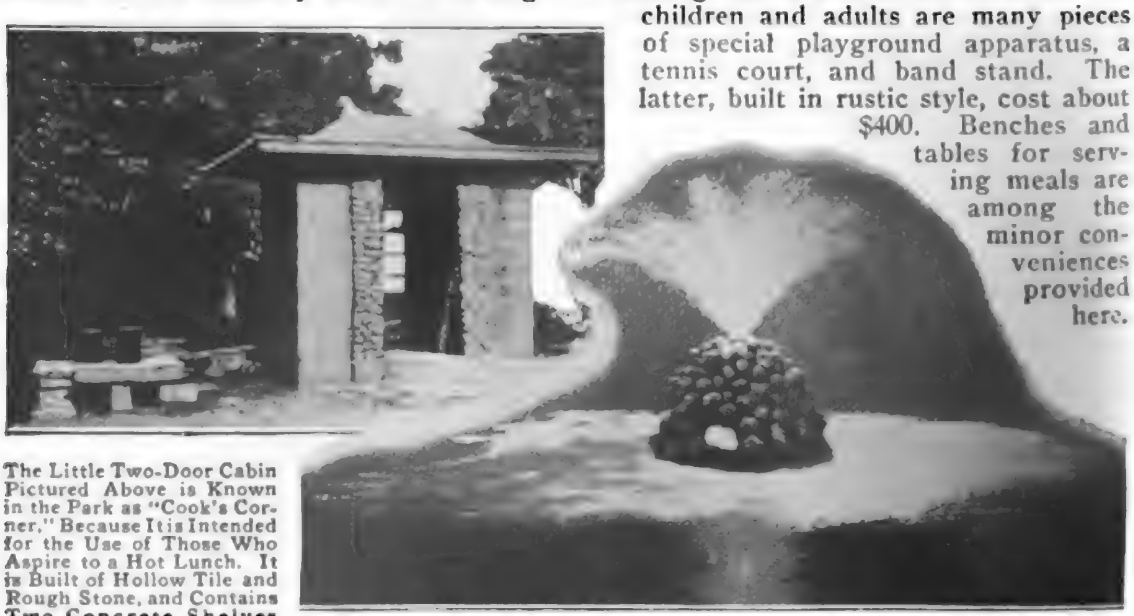
hills and hollows. More often paths are laid out, or stone-flagged steps, with balustrades where advisable, facilitate climbing the bluff or the ravines.

**Even the Band Stand Carries Out the Rustic Idea, Built as It is of Birch and Elm Logs Set in Foundation Posts of Limestone, the Corroded and Honeycombed Surface of the Latter Relieving the Heavy Effect of the Other Material**

A second phase of the plan is the use of native materials, chiefly heavy logs of elm, either peeled or with the rough bark clinging; of white birch for rustic decorative details where strength is not a requisite; and of a peculiar limestone, honeycombed by unequal weathering or erosion, and used in rough, irregular blocks for the masonry work. The original designs were created by the commissioner and were built under his supervision by day labor, which accounts for their extremely low cost. The prices of the various structures mentioned hereafter are only approximate, but are given upon the authority of the commissioner.

Several city conveniences have been conveyed to the park, among them electric lights, running water, and gas. The provisions made for picnic parties attract not only the townfolk, but also motor parties. Drinking fountains are at hand. Their overflow is piped underground and issues from a hillside in the appearance of a spring falling down over rocky ledges. Safe camp stoves have been built. The newest service is the construction, in the summer of 1919, of a "cook's corner" of hollow-tile blocks, with rough stone framing two open doorways. A roof protects from sun and rain, while two solid end walls shelter the flames from wind. A concrete shelf at each end supports several gas plates supplied by a coin-in-the-slot device.

Among the facilities for recreation of children and adults are many pieces of special playground apparatus, a tennis court, and band stand. The latter, built in rustic style, cost about $400. Benches and tables for serving meals are among the minor conveniences provided here.



**The Little Two-Door Cabin Pictured Above is Known in the Park as "Cook's Corner," Because It is Intended for the Use of Those Who Aspire to a Hot Lunch. It is Built of Hollow Tile and Rough Stone, and Contains Two Concrete Shelves Equipped with a Number of Gas Plates, Which Yield Their Fuel on Insertion of a Coin. The Small but Effective Fountain at the Right is Built, as is Plainly Seen, of Bowlders and a Spray Nozzle, and Stands, as a Miniature Island, in the Center of an Artificial Pond Confined by a Cemented Basin**

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View in Decorah's Public Park, with Pillared Entrance to Stairway down the Hill, and Protective Rail of Logs and Stone, Showing Extensive Use of "Honeycomb" Limestone

An Outcropping of the "Honeycomb" Limestone Common to the Region, Used Generously by the Park Builders: Its Corroded Surfaces Result from Unequal Weathering

Observation Balcony on the Bluff, Simply Constructed of Birch Logs and Approached by a Path Bordered with Limestone Fragments to Retard Erosion

**The Playground, in Which a Number of Trees have been Left Standing, Contains Its Full Complement of the Usual Modern Appurtenances, as Chutes, Horizontal Bars, and a Profusion of the Ever-Popular Swings Suspended from Securely Anchored Supports**



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Birch Rails on This Rustic Bridge Contribute Not a Little to Its Attractiveness and Interest, While Its Appearance is Improved by the Simple Arrangement of the Braces. The Piers Are of Limestone

A number of artistic and serviceable structures have been erected. The first to greet the eye of the motor visitor is a pair of stone pillars at the entrance, each capped by a graceful electric-light fixture. A rustic bridge, railed with birch, cost between $100 and $150. A point to be noted about birch is that while it is peculiarly attractive for rustic outdoor construction, it is less durable than other woods and requires replacement every few years. Hillside staircases with log guard rails, and stone pillars and balustrades, were erected for about $25 to $30 each.

An artificial pond occupies a cemented basin, and contains a spraying fountain rising from a miniature island of stones. The cost of this was about $900. At several points on the margins of the bluff, paths lead to lookout stations of birch, floored, roofed, and seated for the comfortable enjoyment of sight-seeing, which is said to be especially attractive when the trees are in autumn foliage. About $75 to $100 covered the cost of each outlook. Possibly the most appealing of all the outdoor furnishings is a long pergola, in the building of which a groundwork of stone bears heavy beams and light birch braces. From high-backed benches a beautiful landscape is visible, framed by the pillars, which are partially draped by green vines. The expenditure of $400 is surprisingly low for a structure of its size.

## TIMBER LINE OF NORTH CREEPS SOUTH

Only the frontier marks the advance of civilization; only the borderland between life and desolation, where nature's last outposts struggle for existence on the edge of everlasting ice, tells the story of the cold that moves inch by inch and year by year to its final conquest of the earth. The timber line of the far North is creeping inexorably southward. Scientists of the Canadian Geological Survey have found that the latitude that permitted the sapling spruces to take root even 50 years ago, now denies them life. The millions of trees that make up the last line of timber today will never reproduce their kind; and when they die, desolation gains another step.

Along the Far-Northern Line of Canadian Forest, Where the Hardy Spruces are Thinning Out as the Cold Grows More Intense from Year to Year

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## AMERICAN NAVIGATION LAWS ARE TO BE MODERNIZED

Thorough renovation of all American shipping regulations, grown antiquated and inadequate in the light of modern requirements, is being undertaken by a commission of 13 navigation experts, appointed by the U. S. Shipping Board. Steamboat-inspection laws will come in for a share of the investigation. Advocates of the revision of these laws are convinced that the progress of the American merchant marine has been hampered by requirements of construction, operation, and inspection declared to be obsolete, and the commission is expected to make recommendations to congress which will remove these obstacles. All criticisms of present conditions are welcomed by the commission, but only if they are supplemented by workable plans of remedy.

## CARNIVAL "FAKER" INFLATES BALLOONS WITH GAS TANK

A toy-balloon vender who sells his wares at street carnivals and county fairs has proved that enterprise brings its rewards in every trade. He no longer inflates his balloons in private, and by lung power or over the gas jet. On the contrary, he prepares his stock before the eyes of the crowd, using a tank of compressed gas. Placing the mouth of each little rubber envelope over the outlet valve, he turns the thumb cock to the left, then quickly to the right, and the balloon is inflated. It's very simple, but it draws a crowd.

## USE TELESCOPES TO DISCOVER VIOLATIONS OF SMOKE LAW

The city of Chicago has an antismoking ordinance which is being rigidly enforced by new and drastic methods. The law, however, relates not to individuals, but specifically to chimneys, and it is sometimes difficult to determine, at a distance, which particular stacks are causing the atmospheric pollution. So the large staff of smoke inspectors congregate on the city-hall roof, and search the horizon with high-powered telescopes. Armed with evidence thus secured, they first warn, and then draw the fires of those who persist in violating the rule.

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**Smoke Inspectors of the City of Chicago, Watching the City's Sky Line through Telescopes to Detect Violations of the Smoke Ordinance**

## ROARING COLUMN OF HOT LAVA SPOUTS FROM MAUNA LOA

Mauna Loa, Hawaii's great volcano, has burst forth in another eruption, hurling a stream of lava 20 to 30 ft. deep and 1,000 ft. wide down the mountain side into the sea. A party of scientists who made their perilous way to within a mile of the fissure reported a new crack from which flowed a lava stream a mile wide, while lava columns, 300 ft. across and 300 to 400 ft. high, issued with a tremendous roar. One molten stream, flowing 20 miles to the sea with extraordinary velocity, has built a quarter-mile-long cape, the ocean meanwhile boiling for half a mile around, causing a small tidal wave.

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## MACHINERY SERVES SHOPPERS IN NEW RETAIL STORE

Few employes are required in a mechanical self-help retail store invented by a southern merchant, though a large number of customers can be given efficient service in a short time. A sectional tier of shelves for the display of package goods is attached to an endless belt which passes around an elliptical base, and is moved either by an electric motor or a gasoline engine. Along the sides of the base stools are provided for shoppers, who select their purchases as the shelves pass in front of them. At the front of the store a ratchet turnstile permits patrons to enter at one side of the base, and to leave at the other. The clerical staff consists of three persons: a supervisor, who regulates the speed of the belt and replenishes the supply of goods on the shelves, a bundle wrapper, and a cashier. The latter two are stationed at desks near the exit.

## EXPLORERS ROW FIFTY MILES THROUGH ARCTIC STORM

A perilous two-day trip in small boats was made by members of an arctic exploring party, and the crew of the vessel which carried them north, after the ship was wrecked late last summer in Hudson Bay. Cold weather was imminent, and it was necessary to reach a fur-trading station, 50 miles away, before ice rendered travel impossible. The men hurriedly provisioned and launched three lifeboats. Though a terrific storm was raging, the voyage was begun immediately. One fragile craft reached the mainland without mishap, but the others, leaking badly, were forced to stop at an island, five miles from shore. Here the occupants of the first boat joined their companions, risking their lives rowing to the island. As soon as the boats were repaired, the men proceeded to the settlement, where later they boarded a ship that returned them to civilization.

## FIND MEASUREMENT FOR SOUND WITH NEW INSTRUMENTS

Sound, though seemingly a very definite manifestation of activity, is peculiar among physical phenomena for its lack of units or means of measurement. An American physicist has finally arrived at a method of expressing sound values in watts, making absolute measurements with new and rather complex apparatus. A standard source of sound, called a "phone," is made adjustable in tone by changing the volume of the resonator and the tension of wires supporting a mica diaphragm. The light-interference method is used to mark vibrational variations in the measuring device, called a "phonometer," lateral displacement being noted by means of a telescope mounted on a tuning fork made of quartz.

## RIVER HOUSE BOAT DRY-DOCKED ON WOODEN PILES

Confronted with the alternative of placing his house boat in a public dry dock for repairs, an expensive proposition, the owner contrived a much less costly means of removing it from the Willamette River, on which it floats. Steel-pointed wooden piles were driven into the river bottom near the shore just before the spring freshet. When the stream rose, the upper ends of the stakes were submerged, and the boat was floated over them and anchored. As the water receded, it left the vessel stranded on top of the piles, making accessible all parts of the hull. With the next high water the craft was again floated, and towed

House-Boat Dry Dock: The Vessel was Floated over the Piles When the River Was in Flood, and Stranded on Them When the Water Receded

to another location. The house boat is 38 ft. wide and 106 ft. long. It is two stories in height, and contains 16 rooms, including a large hall for dancing.

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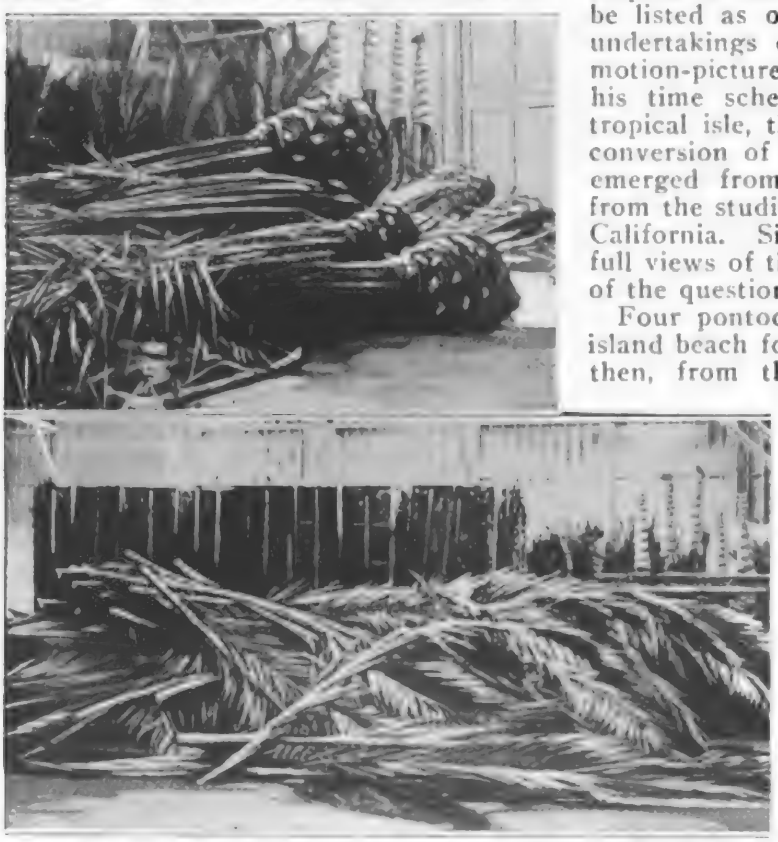
PHOTOS BY WILLIAMS SERVICE

**The "Sheltering Palms," So Conspicuous in the Background, Are a Part of the Hundred That were Transported to the Barren Bit of Rock That Became Magically Tropical, Almost Overnight. The Movie People are Salvaging Their Wreck after the Storm**

## BARREN ISLE MADE TROPICAL BY HERCULEAN LABOR

The transformation of a barren, rocky island in the north Pacific into the verdurous replica of a bit of south-sea tropics, a task recently completed, may be listed as one of the most audacious undertakings ever attempted even by a motion-picture producer. Prevented by his time schedule from visiting a real tropical isle, the director decided on the conversion of a spot of desert rock that emerged from the sea some 100 miles from the studio headquarters in southern California. Since the picture called for full views of the island, "faking" was out of the question.



**Palms and Other Tropical Foliage are Seen in the Upper Picture Ready for Shipment to the Desert Isle, Their Luxuriance to be Increased by Adding the Palm Branches of the Lower View**

Four pontoon piers were built on the island beach for landing the supplies, and then, from the California shore, were shipped more than 100 growing cactus palms, roots and all; 100 orange and 100 lemon trees, bearing fruit; 50 crates of tropical rushes; and large numbers of avocado trees, bananas, sago palms, and grapefruit trees. Coconut palms, however, without which no tropic scene is complete, were beyond the resources of the Golden State, and hundreds of them had to be brought from distant Florida, while 1,000 coconuts in the hull, to dress them

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with, were shipped in from Rio Janeiro. Then 15 horticulturists spent two weeks in planting and arranging the subequatorial vegetation.

The big undertaking was completed by taking to the island equipment and supplies for 40 persons for a month, materials for a four-room house to be built in the picture play, and finally for constructing a realistic shipwreck on shore—firmly anchored to last for the period of the stay. And incidentally, in landing on the rocky shore, the party experienced a real shipwreck.

PHOTO BY GI. IAMS SERVICE

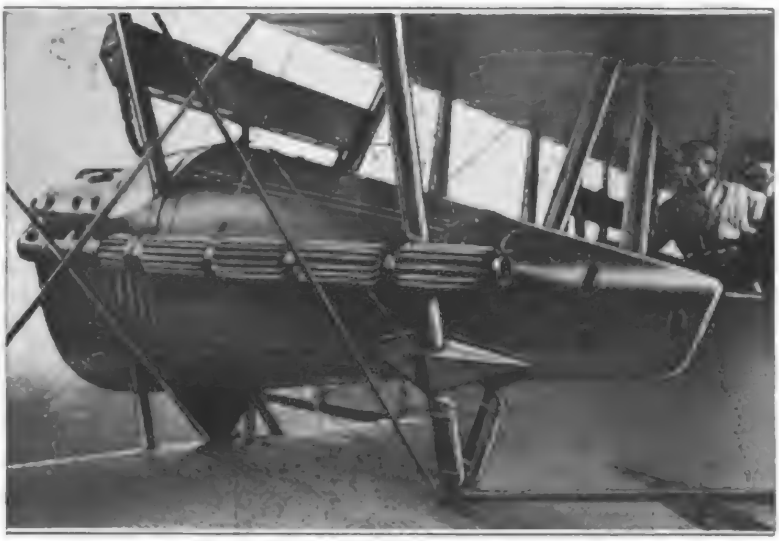
The Wreck of the Yacht on the Make-Believe Tropical Shore, Sent Deliberately to Its Doom to Add Verisimilitude to the Motion Picture: The Hull is Anchored to Preserve Its Appearance through All the Scenes

## CITY WALL OF PEKING TOPPED BY CONCRETE WIRELESS MAST

A wireless mast of reinforced concrete, 164 ft. high and 16¾ in. in diameter at the base, was constructed some time ago for the American navy on the ancient city wall of Peking, China. The wall at this point measures 40 ft. high and 46 ft. wide. A concrete pole of such a height is in itself a novelty, but in this case interest centers on the story of the construction. The 13-ton pole was first cast in a horizontal position, and in two pieces which were to have been erected by elaborate lifting tackle. During erection, however, the Chinese coolies misunderstood a command, with the result that the upper section broke loose and crashed to the ground. The engineers then decided on the more costly expedient of casting the mast vertically from a timber scaffold. With much difficulty an upright mold and scaffold was built, and later held perfectly rigid during the many days required for the concrete to set and dry. Success rewarded persistency, and the mast has now given several months' satisfactory service. In fact, an order has been given for an additional mast.

## FRENCH ARMY ADOPTS MUFFLER FOR AIRPLANE ENGINES

Like all healthy youngsters, the airplane is a noisy affair. Propeller and engine unite to produce a roar that always makes conversation difficult, and, in time of war, supplies to a keen-eared enemy a sure warning of impending danger. Designers are seeking to mitigate the evil, and so far, though unable to deaden the "whir" of the propeller, have produced numerous featherweight mufflers to silence the engine exhaust. The attachment has passed the experimental stage, as the French army has adopted a standard mechanism for war airplanes.



This Airplane-Engine Muffler, Adopted by the French Army, is seen to be Provided with Radial Plates to Increase the Cooling Area, Thus Lessening the Usual Danger of Fire Starting from the Red-Hot Exhaust Gases

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An Awe-Inspiring Spectacle in Manila Harbor: The "Eclipse," Used in the Gasoline Trade, Burning to the Water's Edge Following an Explosion Caused by a Back-Firing Engine

## CONCRETE JACKETS TO ANCHOR POLES DURING NEXT FLOOD

In one low-lying river valley where floods are a yearly menace the local power company has insured the permanency of its service by anchoring the poles in heavy concrete. Each pole is incased, from 6 ft. below the ground to 12 ft. above, in a hexagonal jacket of concrete which is about a foot and a half thick. The solidity of this construction gives the company officials confidence that the next flood will not affect the service along the river.

Comparison with the Man in the Foreground will Reveal the Size of the Concrete Jackets Which are to Anchor These Poles against the Next Overflowing of the River

## EXPLOSION OF GASOLINE BOAT FOLLOWS ENGINE BACK FIRE

A back-firing engine was the cause of an explosion and fire which totally consumed the gasoline-trade vessel "Eclipse" in Manila harbor, P. I., a short time ago. The ship was loading its inflammable cargo for a trip to Cebu when the accident occurred. The alarmed officers of neighboring ships in the well-filled harbor were prevented from giving any assistance by the scattering of burning gasoline and oil, and the vessel burned to the water's edge. It was viewed from the beach by a large number of awed spectators, who silently watched the roll of smoke and play of lurid flame across a brilliant sunset. Only four of the crew were injured, and those not dangerously.

## METAL SHEATHING FOR HOUSES TAKES PLACE OF PAPER

Lining a house with sheet zinc, as a packing case is lined when its valuable contents are to be protected against moisture and vermin, is a new and simple improvement in building methods that promises many advantages. The zinc is sold in rolls like the paper it replaces, and is so thin that a roll of 150 ft., 16 in. wide, weighs only 60 lb. It is easily nailed without preliminary punching, directly to the studding, doing away with all sheathing lumber, and is practically as easy to cut and fit as paper. Added to its great protective advantages, it has a high salvage value.

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# VALUABLE OIL FROM COCKLEBURS

By S. R. WINTERS

THE prickly cocklebur (*Xanthium echinatum*), growing riotously over a wide expanse of territory and hitherto utterly valueless, is to be salvaged to useful purposes. Recent experiments by Prof. L. B. Rhodes, oil chemist of the North Carolina Department of Agriculture, have discovered the pest a container, and potential commercial source, of oil, available for use in paints and varnishes and as an edible product.

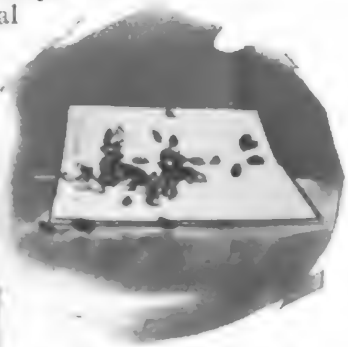
While the investigation has just emerged from the laboratory stage, the product has been given a definite value. Unlike similar developments, the discovery of the worth of the cocklebur was not one of the searching eye of war conservation. Rather, the idea that the wayside weed possessed intrinsic value was conceived in the boyhood days of Professor Rhodes, when he observed that Dame Nature threw a cloak of protection around them. Worms, birds, and squirrels contemptuously pronounce the prickly burs unfit for consumption and ignore them. Mankind, especially those individuals who frequently commune with nature's out-of-doors, will testify to their repugnance for the burs and the opposite inclination of the sticky thorns—a characteristic of clinging tenacity. By a curious quirk of nature, the burs are doubly protected in their seeding habits—one-half of the bur sprouting one year, with the seed rounding out its finished form the succeeding year.

**Experimental Cocklebur Press Made from an Old Letterpress, Two Bits of Iron, and Some Cheesecloth**

The plant, together with other varieties of the same family, is of common and extensive distribution. It grows abundantly throughout the southeastern states, and is extremely prolific in California and Kentucky. The tendency of the plant to "bunch" its growth will facilitate the use of machinery in harvesting the burs—a factor which will ultimately determine the commercial value of the prickly crop.

The chemical process of procuring the oil from the burs is simplicity itself. In the experiments the burs were plucked from the wayside, placed on a table and cut singly in halves, using a trimming board. The sliced portions of the dry burs were deposited in a cigar box and given a vigorous shaking, the scrambling separating the kernels from the hulls as well as unloosing the black covering that envelops the kernel.

**Cutting the Burs in Half with a Photographic-Paper Trimmer, in Order to Extract the Kernels from the Skin and Hull, Done by Shaking the Cut Burs in a Box**



**The Burs as They are Harvested Are Disagreeably Familiar to All**

After the accumulation of a considerable quantity of kernels, they were deposited in a mortar and pounded gently. By blowing across the kernels, the black hulls and chaff were removed. The kernels were then pounded into a meal, the product being of a gray color, savory odor, but of bitter taste, due to the presence of alkaloids. Without further treatment, the meal was incased in bits of cheesecloth and subjected to immense pressure. A discarded bookpress, now almost obsolete in modern-day practice, was employed, with the aid of two pieces of steel only two inches square. The strips of steel were rescued from an abandoned piece of metal discovered while walking along a railroad track. It was sawed diagonally into two parts with a hacksaw. A heavy iron



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washer was placed on the top plate. After remaining untouched for several days, the oil was filtered through an ordinary piece of filter paper.

The oil is of a light yellow color, is sparkling, and has a savory odor. When robbed of its alkaloids, the taste is described as being agreeable, although having no marked characteristics. It retains its qualities well, a sample stored for six months in a dark, cool place failing to develop any rancidity. One bushel of crude burs contains .96 lb. of oil.

The chemist has discovered virtue in the plant as an edible product for man and in the by-products a source of sustenance for cattle. Of technical value, it can be used as a drying oil in paints and varnishes.

The by-products resulting from the manufacture of the oil would enhance the commercial possibilities of the industry. The meal, containing some 40 per cent protein, would be valuable as a fertilizer or in relieving the monotony of cattle diet. The chamber of commerce of Los Angeles, Calif., has requested verification of the protein content with the view of diverting its castor-oil manufacturing equipment into an outfit for experiments with cockleburs.

According to preliminary scientific conclusions this newly discovered material seems to promise important possibilities as a lubricating oil, as an ingredient for the soap manufacturer, and, when produced on a commercial scale, as a new solid-fat substitute for butter and lard.

## STEAM COOKING IN THE FIELD WITH IMPROVISED PLANT

Cooking dinner in the field for a crowd of farmers engaged in a plowing contest has its own terrors, as any farmer's wife will testify who has experienced the heat and smoke produced on such an occasion. During a recent event of the sort in a mid-west farming center, however, the proceedings were effectually relieved of their distress by the exercise of a little mechanical ingenuity. A big steam thresher was halted near the dining tent, and a pipe run from its boiler to a convenient spot. From a T-joint smaller pipes were run, each with a valve some 30 in. from the end. Big crocks, buckets, and wash boilers were filled with water, and a pipe end inserted in each. When the valves were opened the water began to boil, and all the cooking was done, and well done, without heat, smoke, or trouble.

Steam-Cooking Table Improvised in the Field: A Pipe Extends into Each Crock and Bucket, and Steam from a Threshing Machine beyond the Fence Boils the Water and Cooks the Dinner

## CHINESE SALT MANUFACTURERS USE QUEER CALDRONS

Huge vessels composed of plaited strips of bamboo, coated on both sides with a mixture of brine, ashes, and lime, are employed by salt manufacturers on the coast of China for boiling sea water, by which process the product is obtained. Quite frequently these novel caldrons are as much as 21 ft. long, 20 ft. wide, and 7 in. deep, though their size varies. When in use, the troughs are suspended over a mud furnace by straw ropes, which are attached to an overhead frame that is supported by pillars of mud or masonry. Each kettle can be used for 10 days before being discarded. Salt is extracted from it during this period by scraping the bottom. After a container has become unserviceable, it is destroyed, and the fragments are sold to farmers as fertilizer at a price equal to its cost.

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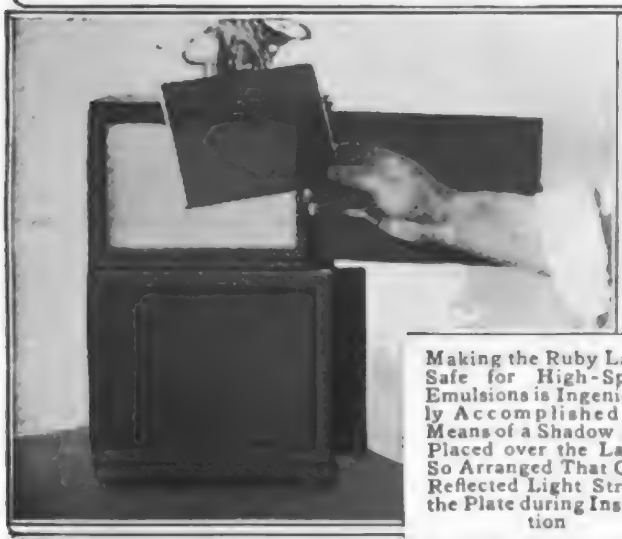
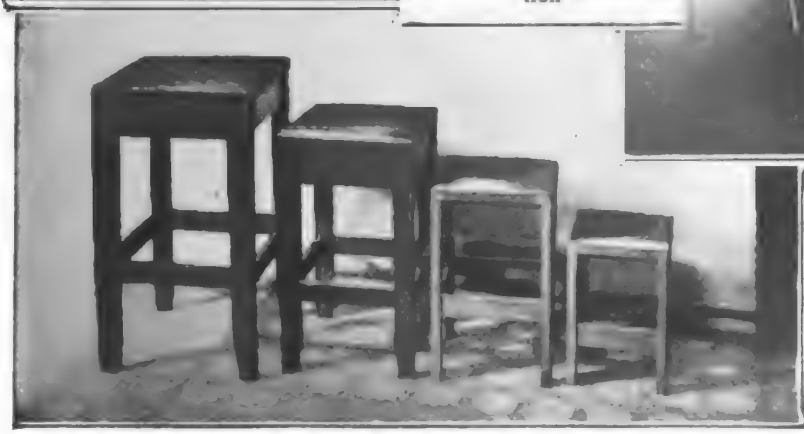
# IMPROVED EQUIPMENT FOR THE PHOTOGRAPHER

A Revolving and Heated Drier, with a Capacity for Handling Hundreds of Wet Prints at One Time, Now Makes It Possible for the Professional Photographer to Deliver Unmounted Pictures, Finished, to the Customer One Minute After They are Taken from the Washing Bath

The Hollow Pedestal of Stoneware Is a Developing Tank, Designed to Handle Large Quantities of Roll Film for the Amateur Trade: Grooves Take the Metal Film Brackets



Making the Ruby Lamp Safe for High-Speed Emulsions is Ingeniously Accomplished by Means of a Shadow Box Placed over the Lamp, So Arranged That Only Reflected Light Strikes the Plate during Inspection



A Valuable Addition to the Studio Furniture Is a New Set of Nesting Stools: They Put Away into Very Little Space, as Seen Above, and When Separated, as at the Left, Accommodate the Whole Family for Almost Any Kind of Group Picture



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## TOBOGGAN SLIDE ABANDONED AFTER FATAL ACCIDENTS

Tragic consequences followed an innocent attempt by American army engineers, on duty in Siberia, to introduce

On This Icy Slide, Built by American Soldiers in a Siberian City, Several Russians Lost Their Lives While Learning to Coast

a new sport to the natives. Utilizing their spare time, the soldiers constructed a steep toboggan slide, and endeavored to teach the Russians how to coast down the ice-covered incline on sleds. The pastime proved popular, but the amateur participants were forced to abandon it within a short time, as several were killed and many injured in the numerous accidents resulting from their inexperience.

¶The world's altitude record for a seaplane carrying a passenger was recently broken when a height of 19,100 ft. was reached over Port Washington, N. Y.

## POPULARITY OF YELLOW LIGHT HAS SCIENTIFIC BASIS

That the general preference for artificial light of a yellowish tint is not a matter of habit, but has a scientific foundation, is the conclusion of illuminating engineers. Recent tests with metal-filament incandescent lamps, gas mantles graded for color, and oil lamps, indicate a greater optical efficiency with the larger number of yellow rays, and an earlier fatigue with blue rays, the candlepower being the same. The effect on the eye was gauged by the blurring of type after steady scrutiny.

## CONTROL ELECTRIC MACHINES BY SOUND VIBRATIONS

A novel method of controlling distant electrical apparatus by means of sound waves has just been demonstrated in England. A small motor vehicle, fitted with a local battery and relays tuned to certain pitches, was started and steered by blowing a whistle at distances as great as a mile. The vibrations used, it is stated, need not be audible.

## MECHANICAL MANURE LOADER HAS ROTARY PITCHFORK

Fork tines at the opposite ends of a revolving metal frame, pivoted at the center, constitute the main element of a new machine for loading manure and other loose farm materials, designed by a Minnesota inventor. The fork tines, which are adjustable to uneven ground, deposit their load on an elevating conveyor, which in turn discharges it into a wagon. A small gasoline engine operates both the forks and the conveyor. The whole machine is light and easily handled, and the amount of manual labor it saves is considerable.

Mechanical Loader for Loose Farm Materials, Seen Stationary in the Left-Hand Picture and in Operation at the Right: The Double Pitchfork, Pivoted at the Center, Has Adjustable Tines, and Delivers Its Load to the Conveyor

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## NEW CONCRETE BRIDGE CLAIMS LONGEST ARCH

**The Center Span, Declared to Be the Longest Ever Laid in Reinforced Concrete, Measures 400 Feet Clear, the Two Side Spans Being 199 Feet, and the Small Ones 55 Feet Each. The Whole Bridge Is Over 1,000 Feet Long**

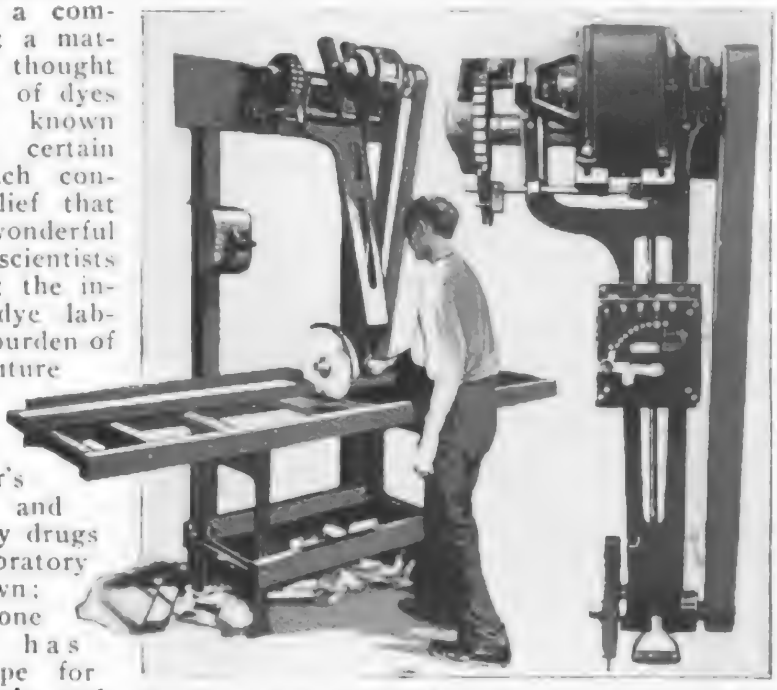
With an arch span measuring 400 ft. in the clear, a reinforced-concrete bridge now being constructed at Minneapolis, Minn., lays claim to the world's record in dimensions of that order. The bridge is 1,032 ft. 7 in. long over all, having, besides the great center span, two of 199 ft. and two of 55 ft. 6 in. An old truss bridge is being used as a working platform in building the structure which replaces it, and the new arch ribs in turn will serve instead of falsework in dismantling the old. Concrete beams and floor slabs are to be precast in units on shore.

## FUTURE OF WAR AND MEDICINE DEPENDS ON DYE INDUSTRY

That an intimate relationship exists between the dyestuff industry and the production of explosives is a commonplace to chemists, but a matter to which no popular thought is given. The connection of dyes and drugs is generally known through the efficacy of certain pain-killing powders, which contribute to the vague belief that coal tar is rather a wonderful composition. American scientists now realize, however, that the intricate chemistry of the dye laboratory may well bear the burden of maintaining this nation's future safety. The gases used in modern warfare, as well as the explosives, must come from the dye maker's intermediates. Adrenalin and salvarsan are two necessary drugs whose source in a dye laboratory may not be generally known; and the representative of one institute of chemists has stated that the one hope for amelioration of tuberculosis and cancer lies in the same storehouse of nature's secrets. The logical conclusion is that much of the responsibility for America's preparedness for peace or war rests upon the development of a substantial domestic dye industry.

## SWINGING SAFETY SAW LOCKS AWAY FROM OPERATOR

A swinging circular saw now being introduced to the woodworking trade not only swings away from the operator when the handle is released, but locks in that position, so that there is no danger of contact with it while removing the sawed lumber. The electric driving motor is



**Saw Frame Swings Away from Operator and Locks Until Handle is Pulled. The Right View Shows the Motor Controller**

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mounted on the inner side of the swinging arm, opposite the pivot at the top, and its weight acts to throw the arm forward, where it is caught by a ratchet. Pulling the handle of the saw releases the ratchet automatically. The whole frame may be hung on any convenient wall or post, and the motor starter mounted directly on the saw arm.

## OPEN VISION SLIT PROVIDED BY DOUBLE WINDSHIELD

An automobile windshield designed to exclude rain, snow, and drafts, without obstructing the driver's view, even by

Side View of the Double Windshield, Showing How the Three Panes of Glass are Arranged in the Two Frames

glass, is being placed on closed cars of a well-known make. Three panes of glass are used. Two of these are pivoted in a slanting frame, while a third is installed at the bottom of a vertical frame back of the other. The frames meet at the front of the roof, and are approximately 10 in. apart on the cowl. By pushing forward the front panes until their edges are separated about 2 in., a vision slit on a level with the eyes of the person at the wheel is provided. When the machine is in motion a vacuum is created between the two sections of the windshield, with the result that air is drawn out of the car body, instead of being forced into it.

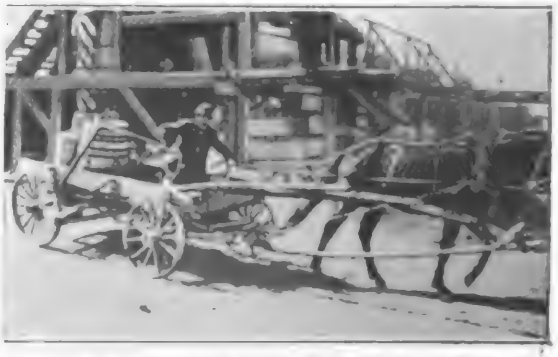
¶Educators in Japan are planning the establishment of a wild-life experiment station similar to, but probably larger than, the one now being laid out at Syracuse, N. Y., on the system recommended by Theodore Roosevelt.

## BRAZILIANS MAKE COMMERCIAL SURVEY OF AMAZON REGION

Trickling coastward from the interior of Brazil, small shipments of vegetable oils, mineral oils, cabinet woods, coal and other minerals, have for years formed the basis of an inconsiderable commerce for the city of Para, called the "Gateway of the Amazon." But busy with its huge exports of Para rubber, the city never made a serious attempt to encourage this miscellaneous and unimportant traffic. Oriental rubber, however, has now usurped the place once held by the Brazilian product, and Para must find other articles of export or see its trade decay. So, up the world's largest river has sailed a party of explorers who will search the innumerable tributaries, and the 4,000 miles of the main stream, for possibilities of commercial development. It is their faith that in the 2,722,000 square miles drained by the river some discoveries surely will be made.

## JURY POLE ON WAGON HELPS ESCAPE FROM DESERT

Resourcefulness is a characteristic of the men who go into the desert for gold, and it has saved more than one from a dangerous situation. Recently a prospector had the misfortune to lose one of his two horses by accident. To abandon his wagon of provisions and water would have been suicidal. He ripped off enough wagon siding to make a pole 15 ft. long, when nailed together. One end of this he fastened to the wagon bed; the other end supported the vacant side of the neck yoke. With this improvised rigging, the single horse was able to pull the vehicle, assisted somewhat by the driver, and finally brought the outfit into town in good shape.



Jury Pole Supporting One Side of Neck Yoke of Two-Horse Wagon, Permitting One Horse to Pull It

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# NEW YORK DIAGNOSTIC CLINIC

By WILLIAM F. GOODWIN

MANY and varied are the instruments used by specialists in surgical and medical practice, each having such devices as are necessary for his particular requirements. Hence, for a complete examination, a patient may sometimes be under the necessity of going from one doctor to another, which, owing to the expense, is prohibitive to many people. Consequently it was impossible for some sufferers to avail themselves of the benefits of modern inventions combined with the highest surgical and medical skill.

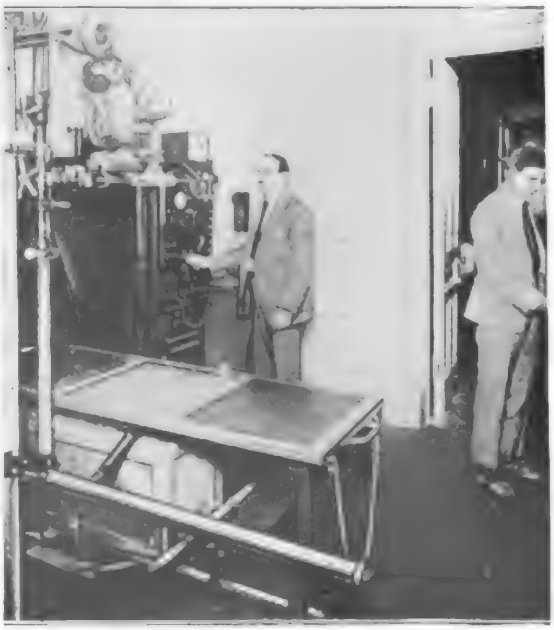
The idea of placing in one building all the instruments and apparatus known for diagnostic use is being carried out by a general practitioner among the

Ear, Nose, and Throat Diagnostic Laboratory: The Instrument on the Stand Is a Special Suction Pump, While the Antiseptic Instrument Case Is on the Right

working classes of New York. The advantages of such an aggregation for diagnosing human ills is obvious, even aside from the fact that it effects a saving of much time and expense to the patients. The institution has recently been opened, and occupies a five-story building, where there are 20 examination rooms and enough specialists to give attention to those seeking a reliable diagnosis. The work of these specialists is performed at certain hours independently. After their examinations are completed they consult with each other, if, in their judgment, a case requires it. The ‘ient is given a report which sets forth ’inctly the nature and extent of the

Dental X-Ray Laboratory: Tube in the Background with Indicating Apparatus on the Cabinet at the Right

trouble found. Such report may be the opinion of one specialist, or it may embody the result of a conference of the examining physicians who participated in the case. The diagnoses thus obtained may be taken to the family surgeon or doctor to be used as guides for future treatment, for it is not the function of these clinics to interfere with the work



Surgical X-Ray Laboratory, Equipped for Stereoscopic Exposure and Study: The Electrical Apparatus Is 7½ Kilowatt



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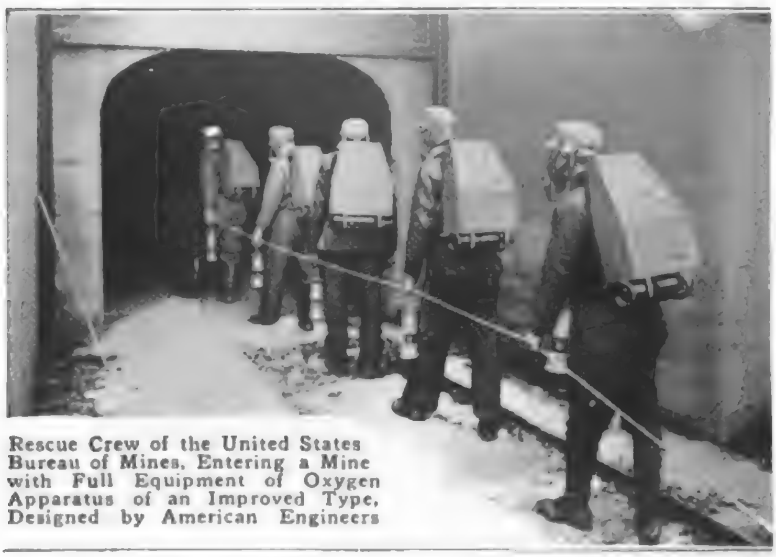
of the regular practicing physicians, but to furnish complete diagnoses upon which future action may be based.

Some persons are so constituted that an accurate record of the action of the heart is almost impossible to make, especially when they are aware that that organ is being tested. To overcome this difficulty it was found that by placing the electrocardiograph — an instrument for this purpose, described in the June, 1911, issue of Popular Mechanics—in the room below the patient, where he could not see or hear the black monster, at the same time having wires and induction coil leading to the examination table, a correct tracing of the heart action could be obtained.

The many complicated and expensive instruments here in use preclude a detailed description of each, but it may be said that no other clinic in the world is so well equipped for diagnostic purposes. Although this institution has been in existence but a few weeks, the results and benefits thus far shown fully justify it.

## AMERICAN EQUIPMENT FOR MINE-RESCUE CREWS



Rescue Crew of the United States Bureau of Mines, Entering a Mine with Full Equipment of Oxygen Apparatus of an Improved Type, Designed by American Engineers

Oxygen mine-rescue apparatus designed by the U. S. Bureau of Mines, and now kept in cars ready for use in every mining district in the country, has proven far superior to the foreign-made equipment formerly used. Thousands of miners have been trained by practice in the application of the apparatus, as well as in other means of rescue, first aid, and safety. In the periodical tests of crews and equipment, gas chambers or "smoke rooms" are arranged to simulate the worst of conditions, and actual explosions of coal dust are caused at the bureau's own mines, devoted to experimental purposes.

As a result of this training, with the use of constantly improved means and methods, it is estimated that fully 5,000 lives have been saved since the bureau was created. There are now about 3,000 fatalities a year from mining accidents, and as many as 250,000 injuries, large and small. It is the aim of the officials to reduce this sinister list at least 50 per cent. Though perhaps the most spectacular, the rescue work is

Physician Examining Each Member of the Rescue Crew as They Emerge from the Mine: This Is a Part of the Periodical Practice Work of the Bureau

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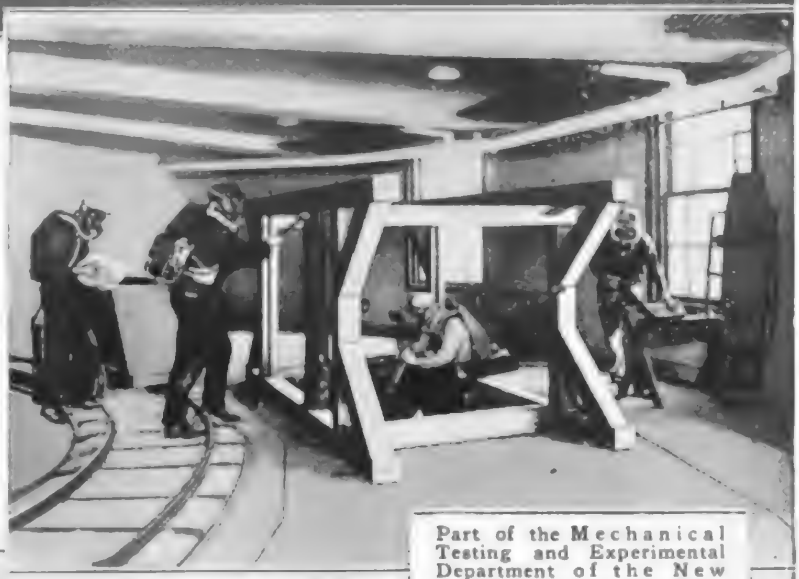
New Laboratories of the Bureau of Mines, United States Department of the Interior, Located at Pittsburgh, and Costing More Than $1,000,000

not the chief accomplishment; prevention is the main concern, and the bureau has just dedicated new laboratories, costing over $1,000,000, for the further study of all causes, chemical and mechanical, that contribute to the dangers of the mining industry.



Part of the Mechanical Testing and Experimental Department of the New Laboratories, the Chief Function of Which will Be the Prevention of Future Accidents

An Intentional Explosion of Coal Dust at the Coal Mine Belonging to the United States Bureau of Mines, Where Actual Conditions of Trouble are Artificially Produced for Experimental Purposes and to Test New Equipment

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## LABORATORY TESTS DETERMINE VALUE OF IMPORTED OILS

Oriental vegetable oils brought into this country through Pacific ports are accepted by consignees only after careful investigation of their value, based on quality, not quantity. Importers maintain laboratories, in which expert chemists analyze samples taken from shipping containers to ascertain the amount of impurities contained in them, including free fatty acids, water, and insoluble particles. Two per cent acid indicates inferior quality, while three per cent means a serious loss in value. As millions of dollars are expended annually for imported oils, the tests are instrumental in saving enormous sums of money. Among the oils examined in this manner are those made from soy beans, cotton seed, coconuts, rape seed, and peanuts.

A Laboratory Test: Skilled Chemists Determine the Value of Different Shipments by Careful Analyses Which Reveal Their Quality

**Gathering Samples of Oriental Vegetable Oils: Long Tubes are Thrust into the Cans for This Purpose. The Picture was Taken on the Docks of a West-Coast City**

## GERMAN NATION'S NEW EMBLEM IS MILD ONE-HEADED EAGLE

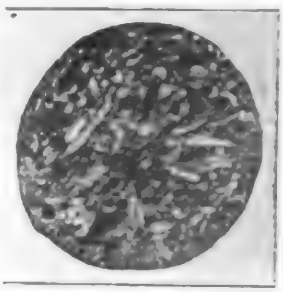
Germany has officially adopted a new national emblem, from which all trace of Hohenzollern influence has been effaced. The design is a one-headed eagle in black, against a field of golden yellow. The crown and collar of the old device, symbolic of imperialistic domination, are wholly lacking, and the attitude is tranquil. The only sinister suggestion in the new escutcheon is the vivid red of the bird's talons, beak, and tongue.

## COMPOSITION AIR PROPELLERS MAY RIVAL WOODEN "STICKS"

Airplane propellers, formed of many layers of canvas bound together by a well-known synthetic condensation product of carbolic acid and formaldehyde, are said to have been used by several contestants in the recent New York-Toronto Air Derby. This report of the successful use of a nonwooden propeller is certain to interest the aeronautical engineer. For years he has been devising elaborate precautions to check the tendency to split, warp, and crack found in every laminated-wood propeller. He has come to regard it as axiomatic that no part of the airplane gives more consistent trouble. The stick made of this composition, on the other hand, is free from all these faults, being a practically homogeneous mass of high tensile strength. It is at the same time of approximately the same weight as the average wooden "prop." Possessing these advantages, its development in the next few months will be watched with interest.

## SHIPWORMS ASCEND PANAMA CANAL WITH SALT WATER

The heavy piling and timbers placed several years ago in Miraflores Lake by the engineers of the Panama Canal Zone were not creosoted. The lake was then a fresh-water body and the ravages of the shipworm, or sea borer, were not feared. But with the gradual infiltration of ocean salt the destructive little animals have arrived in force and have done considerable damage. A typical cross section from an affected log is shown in the illustration. This log was formerly part of the cribwork at the end of Miraflores Lock.



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View of the Tramway Which Links Together the Departments of the International Lumber Mill, Looking toward Canada: The Boundary Line is Located near the Light Support under Which the Man is Standing

## INTERNATIONAL LUMBER MILL ESCAPES PAYMENT OF DUTY

Legislation placing a heavy export tax on unsawed logs shipped from British Columbia has resulted in the establishment of a lumber mill which operates on both sides of the line between the Canadian province and the state of Washington. Before the law went into effect, the entire plant was located in the latter state, 200 ft. from the boundary, but raw material was obtained from the other side. When it was realized that the new duty would make the mill unprofitable, situated as it was, steps were taken to internationalize the business. The sawmill was moved across the line, while the planing mill and yard were left on their original sites. A tramway was built to connect the departments, so that timbers sawed in Canada could be moved into this country, finished, and stored. This arrangement obviates the payment of the export tax, as none is imposed on sawed lumber.

## AUTO CRUSHED BETWEEN CARS BUT OCCUPANTS ESCAPE

Caught between two moving street cars, bound in opposite directions, a small passenger automobile was crushed into a hopeless tangle of wreckage in a western town a short time ago, but the four persons riding in the vehicle miraculously escaped injury. One of the cars was forced from the track by the accident, which, needless to say, created a great deal of excitement.

The Four Passengers in the Wrecked Automobile, Shown between the Two Street Cars, Suffered Only from Fright in the Accident

## DEMOLISH ANCIENT RAMPARTS AROUND PARIS

Once considered an impregnable defense against the strongest enemy, the now obsolete fortifications surrounding Paris are being destroyed to provide ground on which dwellings will be erected to house the rapidly increasing population of the city. Great ramparts of earth, reinforced with stone walls on both sides, are the most important features of the system. These are supplemented by moats, most of which have been filled. An enormous amount of money was expended to construct the barricades, which were built in 1841-46. Some of the area made available by the demolishment of the bulwarks will be reserved for public athletic stadiums, though the larger portion will be divided into building lots.

Part of the Defenses of Paris, Now Obsolete and About to be Razed So That the City can Expand: The Grass-Covered Tops of the Massive Ramparts have been Used as Picnic Grounds

## GREAT DAM WILL REMOVE FLOOD MENACE

A huge $300,000 dam will soon stand sentinel over 36 square miles of California watershed. Natural conditions favor the project remarkably, for Devil's Gate, which drains all the near-by mountain area, offers a natural site, with a sturdy granite floor that will easily support the concrete and rock construction. Measuring 310 ft. across the top and 130 ft. in height, the structure will impound a lake of 6,557 acre-feet, or over 2,000,000,000 gal., of water, during the rainy season, thus ridding Los Angeles and Pasadena of the yearly flood menace, and fitting many acres of arid land for agriculture. An attractive park will relieve the barrenness of the shores, while a hydroelectric plant below the dam will furnish valuable power. The top of the dam will bear a 20-ft. roadway and two 5-ft. sidewalks, adding a serviceable bridge to its other improvements.

The Narrow Rocky Outlet Which will Hold the New Dam

Dangerous Floods Gather Quickly in This Vast Treeless Watershed. Along the Hills in the Background will Run the Shores of the Artificial Lake in Which the New Dam will Impound More Than 2,000,000,000 Gal. of Water during the Rainy Season

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Motor-Driven Beet Harvester: Left, Rear View Showing Topping Device, Bins, and Conveyor to the Latter, Right, Front View, Indicating the Method of Steering with a Tiller, and the Chain Conveyor Which Carries the Beets to the Rear

## NOVEL BEET HARVESTER DIGS, TOPS, AND LOADS BY MOTOR

Sugar beets are dug, topped, and loaded in record time by a new power-driven machine, whose gasoline engine propels as well as operates it. The driver's seat is in front, and a tiller takes the place of a steering wheel. The beets are lifted out of the ground by a fork, thrown on a chain conveyor, and carried to the rear, where the tops are removed. Another conveyor takes them to the bins, which hold the product of one acre. Three acres are harvested, it is claimed, in the time it takes 10 men to work one acre.

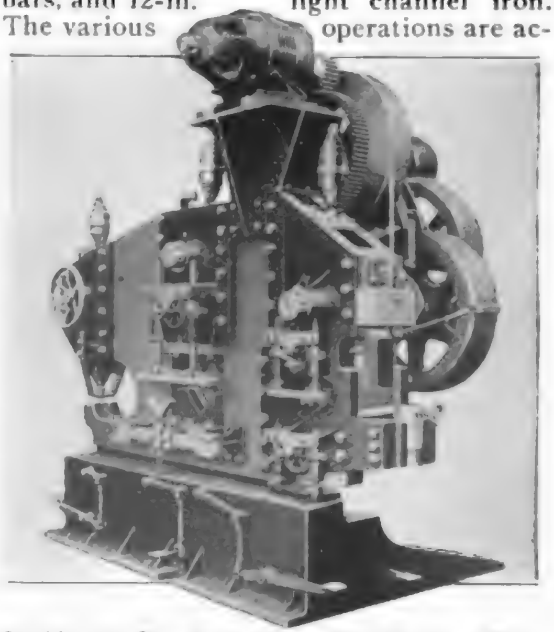
## GREAT OCEAN PORT IS PLAN FOR CITY OF DETROIT

Municipal warehouses for package freight, handling and storage facilities on the water front for large shipments of anthracite coal, and public wharves available to all ships, are among the features of a comprehensive plan to make Detroit, Mich., a great ocean port. Improvement of the St. Lawrence-Great Lakes waterway by the United States and Canada will eventually send much ocean shipping through the Detroit River, and the "City of the Straits" is determined to grasp the opportunity. Creation of an industrial port, for the location of industries along the water front, is included in the plan. The city already owns land on the river which is recommended for use in the initial development.

¶ Railroad development in the new republic of Jugoslavia will be backed in part by a number of American financiers.

## FIVE METAL-WORKING UNITS IN ONE HUGE MACHINE

A shear for splitting steel plates, one for cutting round and square bars, a section cutter for structural shapes, a coping and notching cutter, and a punch press are combined in one huge machine just announced by a large manufacturer. In its largest size this combination tool weighs 55,000 lb., occupies 1,400 cu. ft. of space, requires 25 to 35 hp. for its operation, and cuts 1¼-in. plates, 3-in. bars, and 12-in. light channel iron. The various operations are accomplished by three separate cutting heads, with ample room for each operator. All gears and overhanging members are out of danger at the rear.



Combination Shearing and Punching Machine, Which Performs Five Different Operations with Three Cutting Heads, Enabling Work on Structural Pieces to be Completed in One Place

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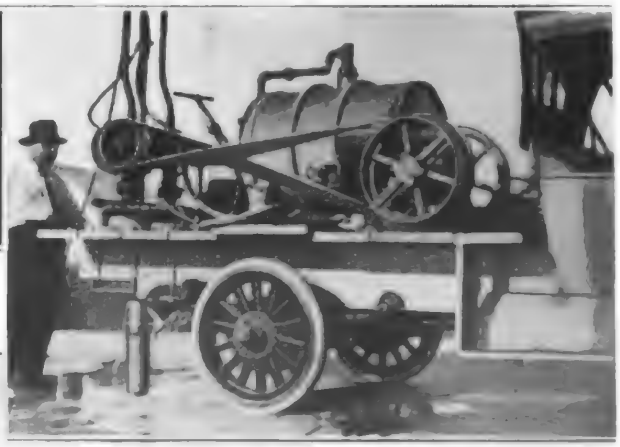
The Portable Testing Drill Cuts from the Pavement the Cylindrical Samples Shown Above. These are Carried to the Laboratory and Tested for Thickness and Wearing Qualities

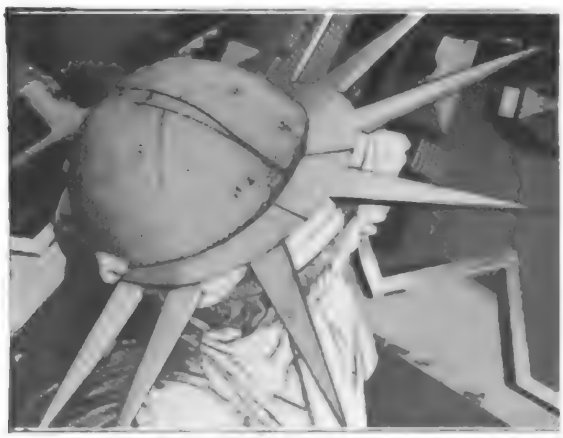


The Drilling Outfit Shown Above is Powered by a Three-Horsepower Engine, and Cuts a Cylinder 4½ Inches in Diameter from the Average Pavement in About 10 Minutes

The Drill, Engine, and Gasoline Tank are Seen Mounted on the Light Auto Truck Which Conveys Them Quickly to Desired Locations

## STATUE OF LIBERTY FOUND WEARING SOLDIER HELMET

The cheers evoked by the Statue of Liberty from every troop transport that lately steamed up New York Bay would have rung still louder had the homecomers known that the "lady" wears a "tin hat" like any fighting Yank. The fact was not learned, however, until recently a seaplane flew low above the



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This Airplane View of the Statue of Liberty, Designed by a Frenchman, Suggests a Resemblance to the "Tin Hats" Worn by Two Million American Defenders of French Liberty

statue and a photographer snapped this close-up of the historic landmark.

## SAMPLES CUT FROM PAVEMENTS BY PORTABLE TESTING DRILL

To test finished pavements for thickness and general quality, the California Highway Commission employs a drilling outfit mounted on a light motor truck. Rotated by a 3-hp. gasoline engine, the drill cuts from the pavement a sample cylinder 4½ in. in diameter. A number of these cylinders, taken at intervals along the new highway, are then subjected to laboratory tests which show with considerable accuracy the average thickness and compressive strength. The very operation of drilling, however, furnishes valuable indications of the wear-resisting qualities. Thus, while concrete pavement made of ordinary materials yields a sample in seven to ten minutes, at least half an hour is required for an aggregate that is hard and tough. The time taken in extracting each sample is recorded, in consequence, and later filed with the laboratory data.

## BUENOS AIRES RADIO STATION TO BE ONE OF LARGEST

Buenos Aires, the South American metropolis, is to have one of the most powerful wireless-telegraph stations in the world. Construction has already been started on the new plant, which is being built by a New York concern. It will have an effective sending radius of several thousand miles, and will be used especially for commercial communication with New York. Stations for direct communication with Spain are also being seriously considered by the Argentine government.

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## THOUSAND EMPLOYES HOUSED IN SINGLE BIG DWELLING

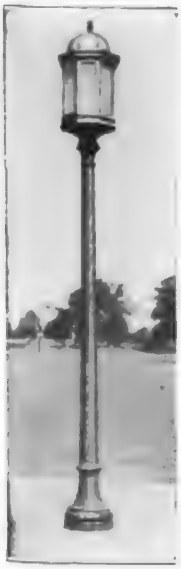
Industrial housing, a term which has come into common use in the last few years, is generally understood to signify a large number of similar dwellings, each accommodating a small group of workers. This arrangement has been decidedly varied by a large auto-manufacturing concern in Michigan. The hotel or clubhouse plan has been adopted, and construction has begun on a seven-story building to cost about $2,500,000. This will afford sleeping room for 1,168 men, and a total of 1,300 can be fed. A well-equipped gymnasium, 72 by 92 ft.; a 25 by 75-ft. swimming pool, and a dozen bowling alleys in the basement will carry out the clubhouse idea, and there will be barber shops and Turkish baths for further service. A 1,300-seat auditorium will be an important feature.

Bottom View of Machine, in Which the Two Brushes of Sponge Rubber Are Visible; The Soap-Compound Container Occupies the Rear

Machine with Oscillating Brushes of Sponge Rubber, Electrically Driven, Scrubs Carpets on the Floor with Soap Compound, Restoring Their Colors

## CARPET-SCRUBBING MACHINE CLEANS THEM ON FLOOR

A machine that looks like a good-sized vacuum cleaner, but which carries a large can of soap solution in place of a dust bag, is the latest contribution to easy house cleaning. The forward end of the machine holds two scrubbing brushes of sponge rubber, and an electric motor oscillates these vigorously 500 times a minute, while the cleaning compound is fed onto them. The result is that the carpets are nicely cleaned on the floor, and their colors restored.



## EXPERIMENTAL STREET LAMPS ADORN CITY BOULEVARDS

For several blocks along one of Philadelphia's great boulevards may now be seen 12 experimental street lamps which are at once efficient in operation, and remarkable for a classic beauty of design. Placed on a concrete safety island in the center of the boulevard, each lamp is raised 14 ft. from the pavement by a slender column of bronze. The lamp itself is designed to produce a maximum of illumination both downward and outward.

¶Rats and mice are multiplying to an alarming extent in Belgium because of the scarcity of cats. As a result the tiniest kitten can be sold for a dollar.

## FAMOUS NOVA SCOTIA VILLAGE HAS ALMOST DISAPPEARED

Immortalized by Longfellow in his famous poem "Evangeline," the village of Grand Pré, Nova Scotia, has almost been obliterated by time. Here and there are evidences that houses once stood on the site, but for the most part these are so slight that they can scarcely be called ruins. Part of the foundation of the church—where, according to the poet, the men Acadians were trapped by British soldiers in 1775—is still to be seen. Picturesque willow trees, supposed to have been planted by the inhabitants of the town before their deportation, have grown to immense size in a meadow which once was dotted with dwellings.

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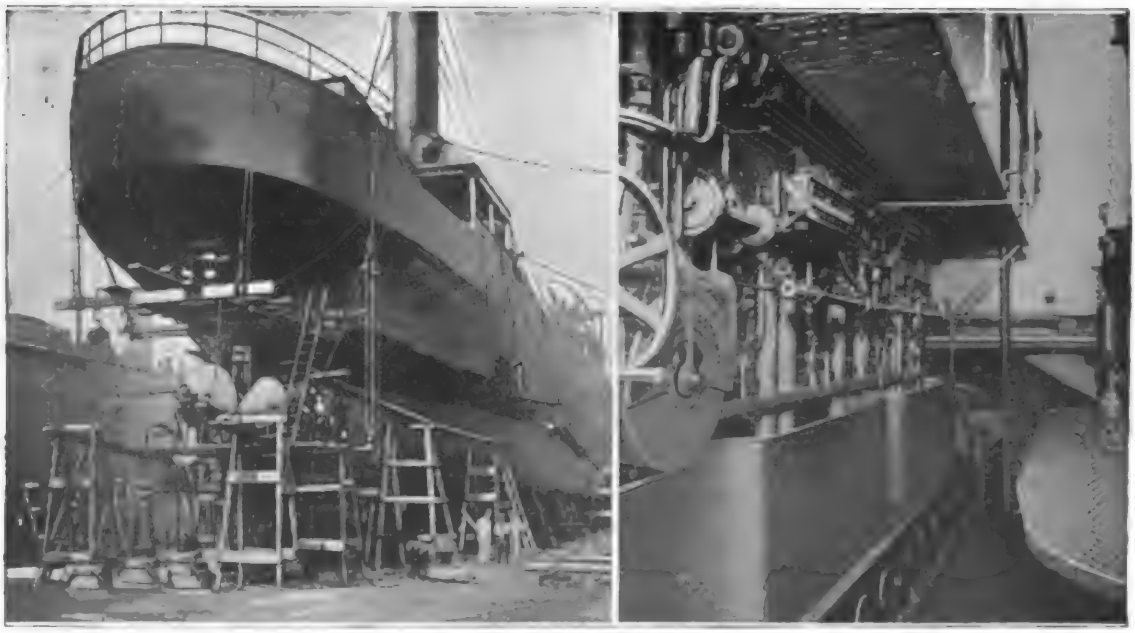

The Process of Installing a Propeller and a New Rudder in a Sailing Vessel, as Part of the Work of Motorizing It, is Seen in the Left-Hand Picture; at the Right, a Big, Modern Oil Engine, is Installed as One of Three Required to Take the Place of the Former Spread of Canvas

## CONVERT SAIL-RIGGED SHIPS INTO MOTORBOATS

Sailing vessels are gradually disappearing from ocean shipping lanes, yielding their places to less picturesque, but more efficient craft, propelled by mechanical means. This process has been hastened during the last few years by the conversion of many former wind-driven ships into motorboats. The method by which this is accomplished is very simple. Sail-rigged vessels are placed in dry dock, where they are equipped with oil-burning engines and screws. Their masts are unshipped and scraped, repainted, and overhauled before they are again put into commission.

Old Sailing Ship, the "Spica," a Tramp for 41 Years, Now About to be Modernized and Equipped with Engines and Propellers, After Which It will Enter the Shipping Trade as a Freighter in Competition with New Steamers

¶Time will turn back three centuries in Plymouth, England, next September when the good ship "Mayflower" once more sets sail. The 180-ton ship, a faithful reproduction of the immortal original, built for motion pictures, is to play an impressive part in the Pilgrim tercentenary pageant.

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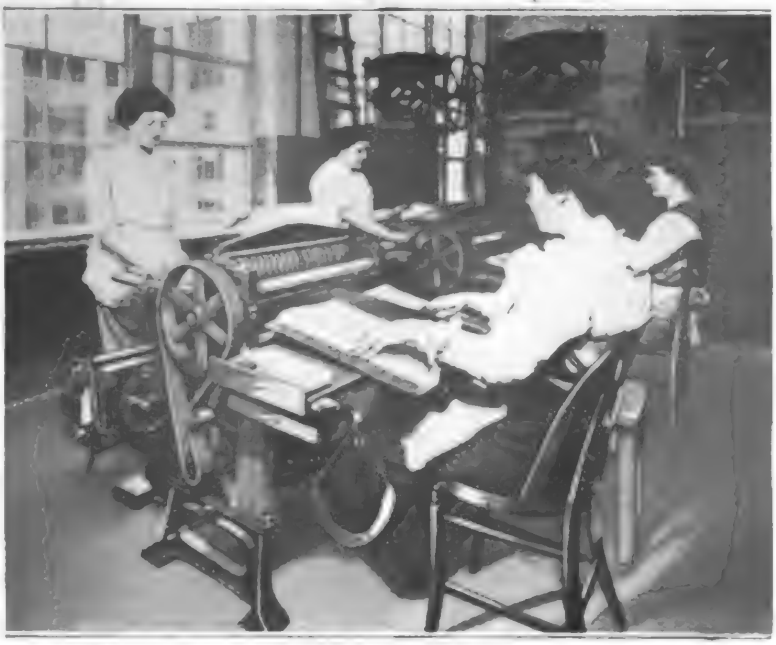
# FIND GOVERNMENT USE FOR STAMP BY-PRODUCTS

By-product utilization has been developed to a high degree by the Bureau of Printing and Engraving, where even the tiny paper disks punched from sheets of stamps by the perforating machines are saved and marketed. An almost unbelievable quantity of these is produced. Four barrels, each containing over 340,000,000 disks, are filled daily. This represents the material removed from 125,000 sheets, each containing 10,920 holes, and 400 stamps, or a total of 1,365,000,000 disks. If the disks were placed on a line with their edges together, they would extend a distance of 863½ miles. Worn paper money also is handled by the bureau. This is reduced to a pulp by boiling in a chemical solution, and the pulp is sold to paper manufacturers in various parts of the country.



**Stamp-Perforating Machines in the Bureau of Printing and Engraving: On the Floor can be Seen the Paper Disks That are Collected and Sold. The Daily Output Is Four Barrels, Representing Material Removed from 125,000 Sheets of Stamps**

## FRENCH SHEEPMEN USE STILTS WHILE TENDING FLOCKS

Stilts are not children's playthings to the picturesque shepherds of southwestern France, but practical utilities which make it possible for them to follow their flocks into the great pine forests of the region during the winter months, when heavy rains keep the dense vegetation beneath the trees in a drenched condition. Equipped with wooden legs, the sheepmen stride through the water-soaked undergrowth, in some places nearly as high as a man, without wetting their clothing. Each one carries a long staff, against which he leans while his charges graze, and knits socks, using yarn spun with wool gathered from the bushes that have torn it off the coats of the many animals under his care. This material usually is collected during the dry season, when stilts are not necessary. The extraction of resin and turpentine from the trees of the forests forms the other major industry of this part of France.

**French Shepherds Testify That There Are Tricks to All Trades, by Spinning Much Valuable Yarn, as at the Left, with the Wool Gathered from the Bushes on the Grazing Lands. The Stilts, at the Right, Are Essential during the Wet Winter Months**

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## EX-KAISER LABORS IN EFFIGY BESIDE WATER WHEEL

If the former ruler of Germany could visit a certain town in Maine he would

As the Water Wheel Revolves, the Figure Representing the Ex-Emperor of Germany Moves as if Hard at Work

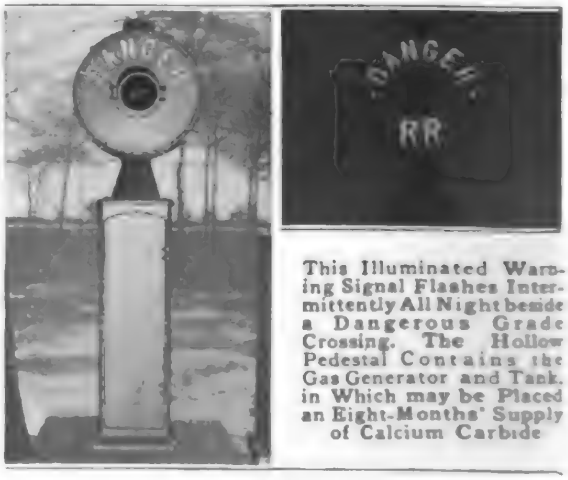
discover what one person, at least, believes proper punishment for the unenviable part he played in the world war—an indefinite sentence at hard labor. Seated beside a small water wheel which furnishes power for a private electric plant, a life-size effigy of the ex-kaiser appears to be turning the wheel with a crank to which its wooden hands are attached. The figure was made and installed by the man who has charge of the wheel.

## PISTONS OF MAGNESIUM PROVE VALUE IN AIRPLANE ENGINES

Magnesium is, next to silicon, aluminum, iron, and calcium, the most common of metals; yet it has heretofore gained popular fame solely as the chief ingredient of flash-light powder. Now, however, with the war-time development of a cheap electrochemical method of extraction from the ore, American experimenters are promising many uses for alloys containing magnesium as a major element. One great industrial laboratory has actually built and tested, in a six-cylinder airplane engine, a set of pistons and connecting rings of this material. Used in this way, as a reciprocating mass, its light weight (approximately 40 per cent less than that of aluminum) has resulted in a 10-per-cent gain in engine efficiency. Its other characteristics—strength, good wearing qualities, and high heat conductivity—also promise interesting developments in this field.

## ILLUMINATED SIGNAL FLASHES WARNING TO DRIVERS

Railroad grade crossings are dangerous at all times, but especially so at night, or in stormy weather, when ordinary warning signals are passed unnoticed by the average driver of an automobile or other vehicle. One of the latest devices for preventing nocturnal accidents at such points is a sign which is illuminated intermittently by an automatic mechanism operated by acetylene gas. The letters of the sign are cut in a round metal box, 30 in. in diameter, which is mounted on a hollow pedestal containing the gas generator. In the center of the box is a red lens, which is lighted simultaneously with the letters. Usually the mechanism is adjusted to provide 60 flashes of light a minute, but this can be varied. The lamp consumes less than 1 cu. ft. of gas in 24 hours. An eight-months' supply of calcium carbide,




This Illuminated Warning Signal Flashes Intermittently All Night beside a Dangerous Grade Crossing. The Hollow Pedestal Contains the Gas Generator and Tank, in Which may be Placed an Eight-Months' Supply of Calcium Carbide

from which the gas is derived, can be stored in the generator tank.

¶ To test its fitness for the market every consignment of preserved-food products imported into Argentina is now sampled and subjected to chemical analysis.

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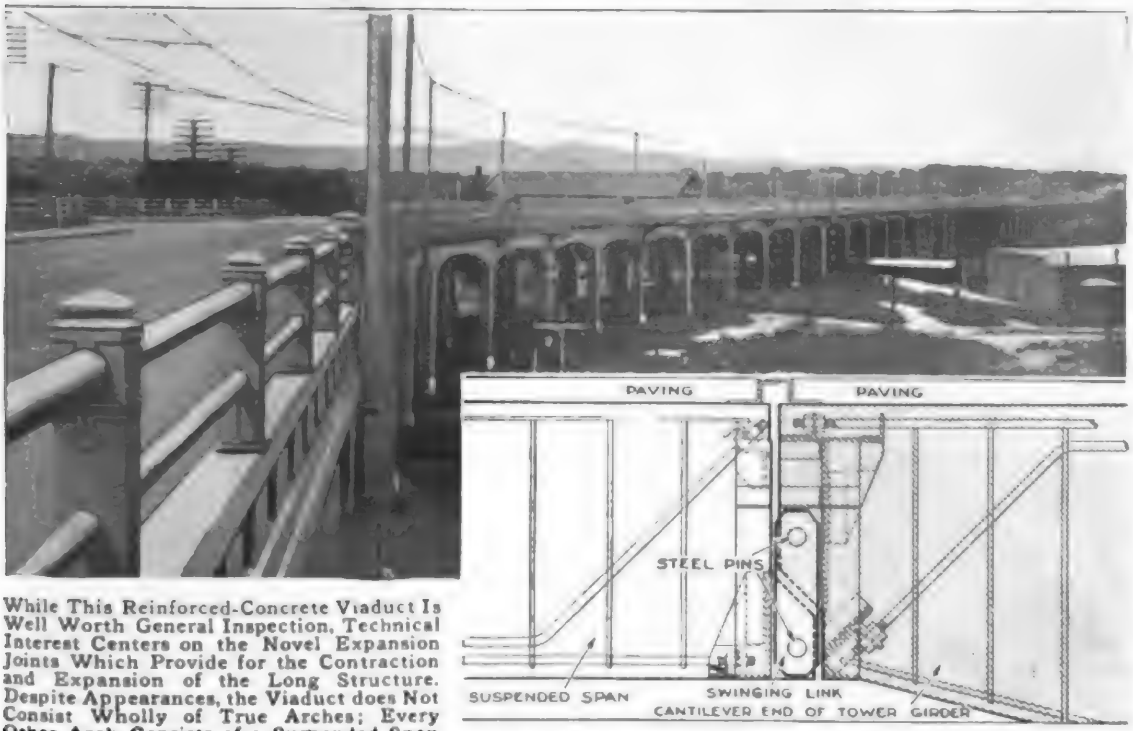
# CONCRETE VIADUCT HAS NOVEL EXPANSION JOINT




**While This Reinforced-Concrete Viaduct Is Well Worth General Inspection, Technical Interest Centers on the Novel Expansion Joints Which Provide for the Contraction and Expansion of the Long Structure. Despite Appearances, the Viaduct does Not Consist Wholly of True Arches; Every Other Arch Consists of a Suspended Span Held between the Cantilever Ends of the Tower Girders. The Heavy Pin-and-Link Suspension is Explained in the Diagram at the Right. Each Suspended Span Is 20 Feet Long**

With nearly a mile and a half of reinforced-concrete structure to be provided for, the new Colfax-Larimer viaduct at Denver, Colo., offered a difficult problem in connection with expansion and contraction caused by heat and cold. The difficulty was complicated by the condition that the structure is in effect two viaducts, one carrying Colfax Avenue and the other Larimer Street. These intersect 35 ft. above the ground at an angle of about 30°, and are bound together as one structure.

The viaduct has the appearance of a series of flat concrete arches with an average span of 40 ft. Alternate spans are true arches, as they seem, while the intermediate spans are transformed by the expansion joints into cantilevers, with true cantilever arms and suspended spans. The expansion device is a heavy steel plate that acts as a swinging link, placed at each quarter point of the arch and leaving a suspended span of about 20 ft. The link is suspended from a 2-in. steel pin passing through the steel reinforcing of the cantilever arm, and, in turn, it supports the suspended span by a similar arrangement. In this way complete freedom of adjustment in length due to changes in temperature is provided. The expansion joint is covered by a steel plate painted to resemble concrete, effectively concealing it.

The Larimer Street viaduct, 2,860 ft. in length, connects the business district with the railroad yards. The Colfax Avenue viaduct has a length of 5,859 ft., with the concrete structure interrupted near the west end by a steel span over the South Platte River, and is the latest of five viaducts built to connect the east and west sections of Denver.

## MAINMAST OF FARRAGUT'S SHIP TO ADORN CHURCH LAWN

The mainmast and spars of the "Hartford," flagship of Admiral Farragut in the Civil War, will be erected on the grounds of a church in Hastings-on-Hudson, N. Y., if the plans of the congregation are approved at the New York Navy Yard. The church was founded years ago with the prize money won by Farragut in the capture of Confederate blockade runners. On learning that the old "Hartford" is to be condemned to the scrap heap, the members of the church have consequently been aroused to make every effort to secure this unusual and desirable souvenir.

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## STEAMER COLLIDES WITH BERG BUT REMAINS AFLOAT

Not far from where the "Titanic" disaster occurred in 1912, the steamship "Grampian" crashed into a huge iceberg recently, but escaped the terrible fate which overtook the great liner. Because of the shape of the berg, whose upper portion overhung the base, no damage was done to the vessel below the water line, though the bow above was crumpled into a shapeless mass of steel by the impact. Two of the crew were killed and several injured. After the collision the ship returned to St. John's, Newfoundland, under its own power.

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Steamship "Grampian" after Colliding with an Iceberg off the Coast of Newfoundland: No Damage was Done below the Water Line, So the Vessel Returned under Its Own Power

## TEXTILE INDUSTRY TO USE NEW AMERICAN COLORS

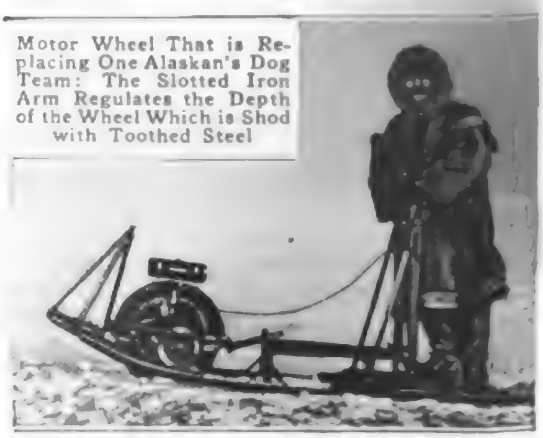
Like a "declaration of independence" from German domination of the dye industry, comes the announcement that next spring will see on the market 78 new and staple shades, all "made in America." Germany's best showing is beaten, it is believed, by this large array of colors. Among these new shades which are to gladden the heart of the American woman of fashion are "date," an Arabian golden brown; "sponge," a brownish ocher; "musketeer," a dark blue-green; "middy," a scintillating navy blue; "eagle," a shade of brown; "aztec," a yellowish brown; "aero," an atmospheric blue; "firefly," a red and orange; "cinder," a gray; "scarab," a bluish green; "Venice," a turquoise blue; and "rosebud," a brilliant pink.

## WOVEN FACES AND CORRUGATED CORE FORM NEW PLYWOOD

Recent discussions of plywood, as developed by the Forest Products Laboratory, lend interest to another strange composition now under investigation. A sample of this new board, 8 in. square and about 3/16 in. thick, weighs less than so much cork, yet is astonishingly rigid, and has been proved free from shrinkage. Its value for air-craft construction is obvious. More remarkable than its properties, however, is its construction. The core, or body of the board, is seen to consist of thin, corrugated, or "wavy," plywood. Inclosing this core are two faces, each about 1/32 in. thick, and each formed of many strips or ribbons of wood, 1¼ in. wide, which weave under and over each other in checkerboard fashion. Casein glue holds in its rigid grip the many components of this odd plywood.

## ALASKAN MOTORIZES HIS SLED WITH BICYCLE POWER WHEEL

By attaching a bicycle motor wheel of familiar type to his simple sled, an Alaskan voyager has opened a speedier way for himself across the snow, and discarded his dog team. The wheel is rimmed with toothed steel instead of rubber, and its depth is regulated by a slotted iron arm. The rider stands at the back, with all controls on the dash before him.



Motor Wheel That is Replacing One Alaskan's Dog Team: The Slotted Iron Arm Regulates the Depth of the Wheel Which is Shod with Toothed Steel

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## MOVE THREE-STORY BUILDING OF BRICK AND CONCRETE

Office workers went about their tasks as usual in a three-story 3,000-ton brick and reinforced-concrete building at Detroit recently while the structure, 60 by 95 ft. in plan, was moved 450 ft. across a vacant lot and a street to a new foundation, a feat declared to be without precedent. The building was raised with jacks and placed on steel beams, which in turn rested on heavy cross timbers. Hardwood rollers between the timbers and supports underneath allowed the ponderous mass to be pulled by two electrically operated winding drums, equipped with strong steel cables. Telephone and electric service were maintained while the operation was in progress, and the building arrived at its new location in good condition, showing little evidence of its unusual performance.

**Moving a 3,000-Ton Three-Story Brick and Reinforced-Concrete Building: In the Foreground Is One of the Electrically Operated Winding Drums Used for Pulling the Structure, Whose Occupants Were Not Disturbed by the Transmigration**

## OLD AUTO BODY CONVERTED INTO CAMPING TRAILER

Lack of a serviceable engine does not render an automobile useless. This was demonstrated by a western motorist recently when he removed the body of an old touring car from its chassis, mounted it on the rear wheels, and attached the cart thus formed behind a new machine. Camping equipment can be carried in the improvised trailer, or it may be converted into sleeping quarters by the installation of a mattress and springs.

**Camping Trailer Made from the Body and Rear Wheels of an Old Automobile: It can be Used as a Bed or for Carrying Equipment**

## CONDUCT CHILDREN'S BANKS ON CONVENTIONAL LINES

An example of a successful public-school savings-bank system is to be found in Nottingham, England, where the institutions are conducted as far as possible in the same manner as ordinary banks, thus not only adding to their educational value, but creating in the minds of the youthful depositors a feeling that their financial houses are of as much importance as those patronized by their elders. Books in which are kept records of deposits, amounts withdrawn, and balances due are used by the children. Deposits are placed in local banks, and the accounts are audited quarterly. Once each week deposits are received and withdrawal orders paid, teachers acting as tellers. Sums as low as two cents are accepted. There are 104 of the banks in Nottingham, with 15,234 depositors, and with aggregate deposits of $19,128.

***Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.***

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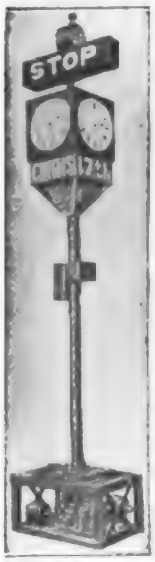
## TRAFFIC SEMAPHORE OPERATED BY MOTOR AND CLOCKWORK

An automatic crossing policeman, whose commands are declared to be just as effective as those of a regular traffic officer, has been devised by a Denver inventor. Signs reading "Stop" and "Go," illuminated at night, show at right angles at the top of a pole, which, at intervals, turns one quarter of a revolution, actuated by an electric motor and clockwork in the base. The time period of each position may be adjusted to give the busiest street the longest interval of use. A bell rings loudly before the pole turns. Lighted street names and a four-dialed clock complete the assembly.




## LAND-CLEARING METHOD BURNS STUMPS ONLY AT ROOTS

A farmer in Minnesota is clearing his land of stumps by burning out only the roots, after which he topples over the unharmed part above the ground and takes it home for firewood. He believes that the valuable fuel salvaged in this way is ample payment for the effort his method requires. Beside each offending stump he digs a hole, from which he bores a passage, through the roots, to a stovepipe set into the ground on the other side. A fire lighted in the hole soon generates a draft up the pipe, thus sucking the flames through the roots.

From the Pipe a Passage Leads through the Roots to a Hole in the Ground at the Opposite Side of the Stump. Here Burns a Fire Which is Sucked through the Roots and Soon Destroys Them

## SPORTSMEN SAIL TO ARRANGE AIR RACE AROUND THE WORLD

"The International Aerial Derby around the World" passed from fancy to fact a few days ago when a special commission, consisting of three famous millionaire sportsmen, sailed from America for a tour of the world. In the important cities of a dozen countries they will confer with the highest aeronautical and sporting authorities regarding routes, landing places, referees, and local organizing committees. Stops at all these cities will be compulsory, only the two transoceanic routes being left to the decision of the entries.

The rules which are to govern the contest are as liberal as they are unusual. As each entrant will be allowed to use as many airplanes or dirigibles as he finds necessary, the contestants will enter the race as individuals, instead of entering their air craft as in the past. Two or more contestants may charter the same air craft for part or all of the journey. In making connections between air craft the competitors will be permitted to use other means of transportation to the extent of 10 per cent of the distance to be traveled. The winners will be rewarded by prizes expected to total $1,000,000 or more.

## HOG ISLAND MAY BECOME HUGE TRANSATLANTIC TERMINAL

Hog Island shipyard, the greatest ship-assembling plant in the world, is under option to the corporation that built it, which already owns the land and is expected to take over the entire property. Practically another year will be required to complete the 77 ships still to be built, so its disposal will not be immediate. The plan, however, is to turn the island, whose remarkable facilities were described in Popular Mechanics Magazine for October, 1918, into a great transatlantic terminal, discontinuing its constructive function. Its 50 steel shipways and other equipment cost the government some $60,000,000, besides a six-per-cent rental on a ground valuation of $2,000,000.

¶ Rifle periscopes, consisting of small mirrors in a heavy tin case, may soon be offered on the market as novelties, or accessories in boy-scout drill practice. The Ordnance Department has listed 160,000 of them as surplus material.

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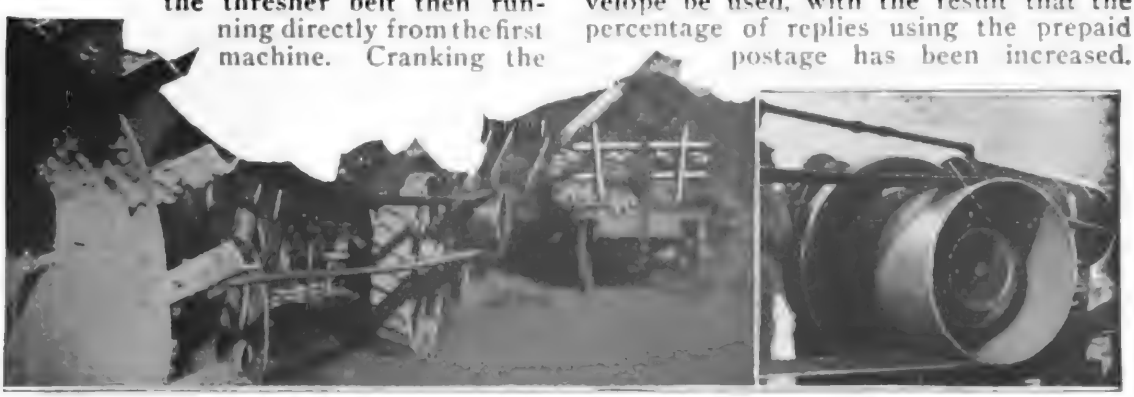
**ENORMOUS CALIFORNIA GRANITE QUARRY SUPPLIES THE NATION**

**CALIFORNIA is noted especially for its fruits and flowers, but the state's products include many other important commodities, little known to the average person. Among these is granite, which is obtained from an enormous and apparently inexhaustible quarry at Knowles, from where it is shipped all over the United States. The stone is extremely hard and durable, and, when polished, its beauty is unsurpassed by any found elsewhere in the country. It is transported in huge blocks, which are roughly surfaced before being placed on freight cars.**

## TRACTORS BELTED IN TANDEM DRIVE RICE THRESHER

In southern Arkansas rice is quite an important crop, about 6,000,000 bu. being produced. A grower in that district who used a large rice thresher, requiring 35 hp. to drive it, solved his power problem by belting two tractors together in tandem. The tractor nearest the thresher has a flange bolted to its belt pulley to receive the belt from the rear tractor, the thresher belt then running directly from the first machine. Cranking the rear tractor and throwing in the clutch starts the other, which then takes up its share of the load.



**In the Foreground at the Left, Two Tractors Belted Together in Tandem, Drive the Rice Thresher in th Background. At the Right Is Detail of Belt Flange Fixed to Pulley of First Tractor, to Receive Drive of Second**

¶ Recognizing the fact that many stamped and addressed envelopes inclosed with circular-letter advertisements are consigned to the waste basket by their recipients, a California manufacturing company prints on the face of these articles a legend calling attention to the stamp, and a request that the envelope be used, with the result that the percentage of replies using the prepaid postage has been increased.

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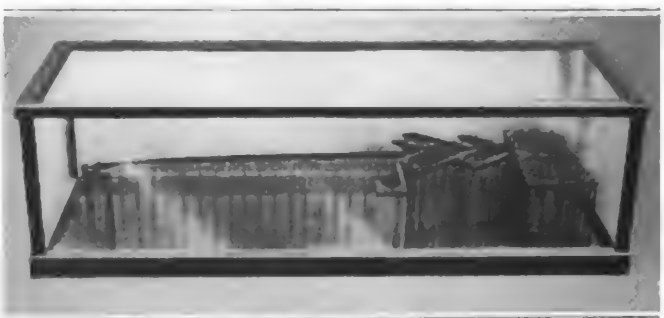
# PIRATES OF THE SILVER MAIN

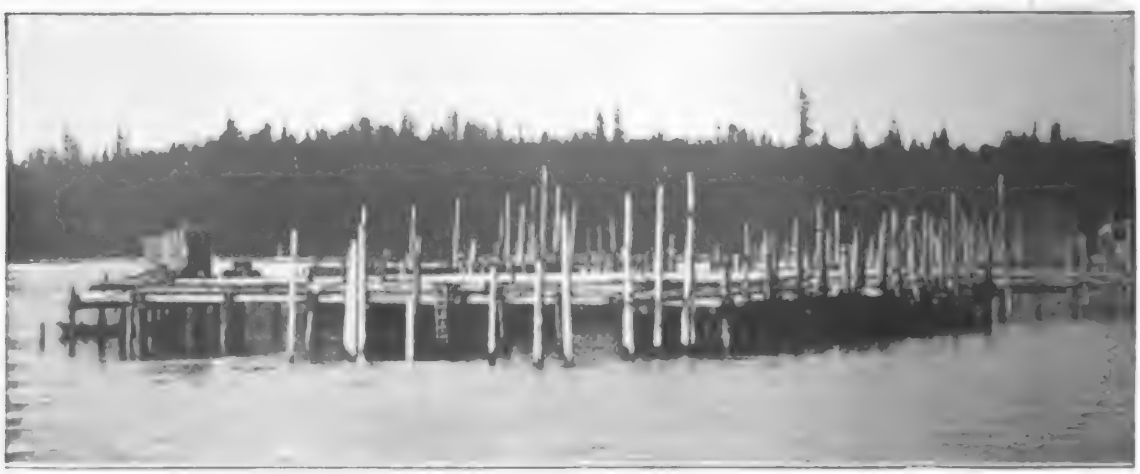
The Gunboat "Marblehead," Which Recently Won the Everlasting Gratitude of the North Pacific Fishermen by Steaming Alaskaward to Clear the Seas of Fish Pirates, Grown Daring and Numerous of Late

RECENTLY the gunboat "Marblehead," returning to San Francisco with a relief expedition which had gone north to fight an epidemic of influenza among the Alaska Indians, received hurry-up orders to sail again for the North to combat organized gangs of pirates who were robbing, on a most efficient scale, the fish traps of the North Pacific. The "Marblehead" proceeded immediately to the vicinity of Juneau, to which place three naval subchasers and a squad of volunteer ex-service men also were dispatched. War on the pirates along the coast was begun, and within a week several of the alleged thieves were rounded up.



Model of a Salmon Trap of the Kind Used in the North Pacific, in Which the Fate of the Luckless Fish Becomes Apparent, as They Follow the Line of Netting into the Maze of Pockets at the Right

Pirates have been a menace to these fish traps for years. Fishing boats have brought down tales of their



The Way a Real Salmon Trap Looks: Not So Neatly Finished as the Model, but Vastly Effective in Stopping the Great Schools of Fish That Go Cruising Down the Coast Looking for a Good Spawning Bed



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bold depredations all along the coast from the rim of the Arctic as far south as Ketchikan. It evidently is now the government's determination to end this piracy for once and all time.

The salmon runs begin early in July. The first run is followed by another around the middle of August. At every projection of the coast line a trap is located to catch the silver horde as it swims with the Japanese current in search of suitable rivers in which to spawn.

The salmon trap consists of poles, or piling, driven in a line several hundred yards straight out into the water. At the outer end of the barrier, over which galvanized wire or cord netting is strung, is a series of pockets into which the salmon, seeking to swim round the barrier, enter and lose their way. From pocket to deeper pocket the fish dart, finally entering a square inclosure through an aperture which from within appears as a part of the entrapping wall. This last pocket, the one from which the fish are taken, is equipped with a bailing net, which rests on the bottom and is raised regularly every day to clear the pocket.

Because of the large number of traps located along the coast, seldom more than one watchman can be maintained at each trap, and the bailing of the pockets is done by a boat and crew of men who have a string of a dozen to a score of traps to visit in the course of a day's work. These isolated watchmen often fall easy prey to the brazen pirates who, under the cover of darkness, steam up to a trap, overpower the watchman, lift the net, and bail the pocket of its accumulated horde, then proceed to sea again, not to reappear until they find an opening for another "catch."

The Salmon are Loaded from the Traps to the Hold of the Fish Boat by Means of a Portable Conveyor into Which the Fish are Scooped by the Fishermen. The Pirates Become Quite as Expert and Rapid in This Work as the Owners, and Clean Out a Number of Traps in a Day

The Last Pocket in the Salmon Trap Is a Big Square Inclosure, and on Its Bottom Lies a Great Net. When This is Raised, after a Run of Salmon, the Observer Begins to Realize the Extent of the Fisheries Industry, for the Pocket Often Contains More Fish Than Water

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¶A butterfly "farm" has been started in central France to supply the scientists' demand for the beautiful insects. On mulberry, oak, plum, hawthorn, and other trees and shrubs, the caterpillars are placed to spin their cocoons. These are then confined in little wire cages into which the butterflies emerge. The butterfly "farmer" is also experimenting with many varieties of silkworms in the hope of producing a fine silk in more northerly climates.

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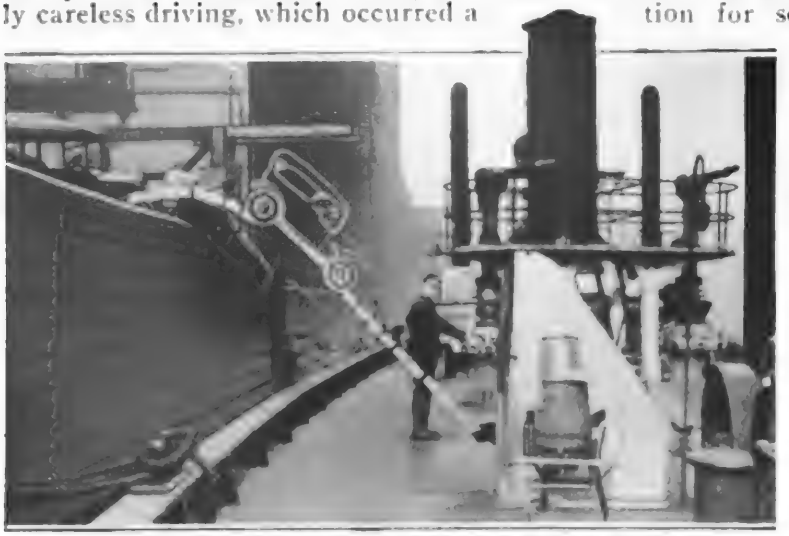
## AUTO PLUNGES FROM STREET TO DECK OF FIRE TUG

A fire tug intervened to save an automobile driver from death or serious injury in a peculiar accident, caused by unusually careless driving, which occurred a short time ago in a middle-western city. The boat was moored at the foot of a street when the car, running at high speed, plunged into space at the termination of the thoroughfare and alighted on the vessel's deck, about 10 ft. below. Slight bruises were sustained by the motorist, who was alone in the machine. The automobile was completely wrecked.



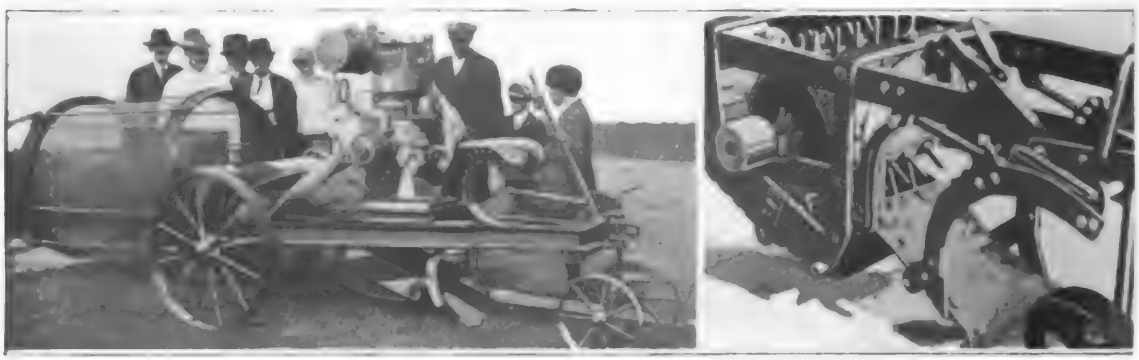
Scene of an Unusual Accident: A Motor Car Plunged 10 Feet to the Deck of a Fire Tug, but the Driver was Hurt Only Slightly

## ENGLISH BUSINESS MEN VALUE LONDON-PARIS AIR SERVICE

The daily airplane passenger service from London to Paris and return has now been in successful and regular operation for several weeks. Each day the planes start and arrive at approximately schedule time, though often forced to battle heavy storms. As the reliability of the new service is demonstrated, English business men evince a growing interest, and book more and more space for passengers and freight. Crowded for time, the man of large affairs is finding it increasingly convenient to use the airplane. If he lives in London, an automobile calls at his door and whisks him to the suburban airdrome. Thence the flight to Paris is made in two hours and a quarter if he rides in a small plane like the DH-4, or in about three hours if he cares to share a Handley Page with a dozen others. Those responsible for the new service are hopeful that the arrangements between the British and French post offices will soon permit the carrying of express letters by airplane and dirigible.

## MACHINE ERADICATES WEEDS BY PULVERIZING SOIL

A machine which exterminates weeds in cultivated fields by taking up strips of soil, pulverizing it, and returning it through a sieve, is a late addition to the implements of farming. A flat plowshare cuts a furrow, 16 in. wide and 4 to 6 in. deep, as the machine is drawn by horses or tractor. The ribbon of soil passes over the plow onto a toothed drum, which shreds it and returns about



Weed-Exterminating Machine Which Pulverizes Soil: The Flat Plow Point and Conveyor Are Visible under the Chassis in the Left-Hand Picture and in Detail at the Right. The Rotary Sieve Is at the Rear of the Machine

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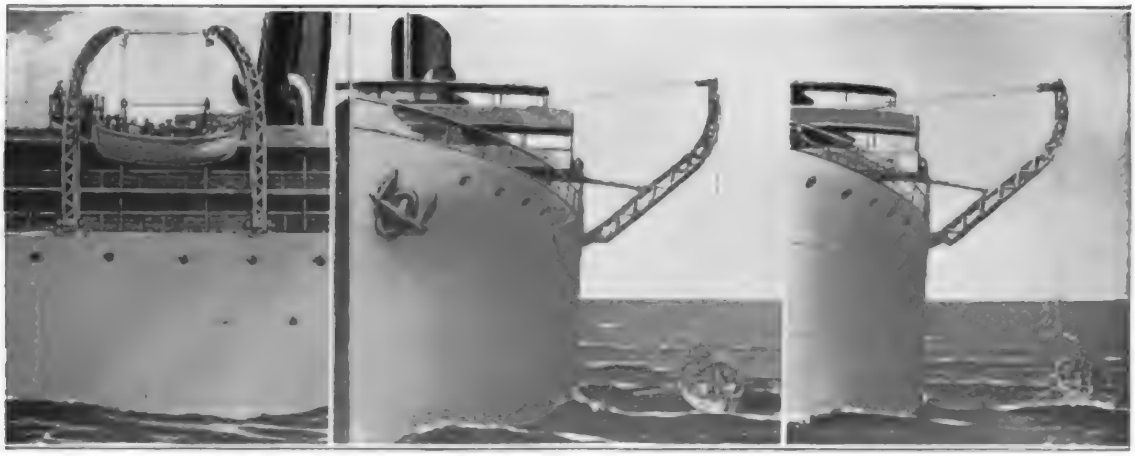


Left, Side View of Ship Equipped with Lifeboat-Launching Device: The Two Steel Arms are Pivoted on the Rail. Center, the Arms and Tackle Swinging the Boat to the Sea. Right, the Tackle Released from Its Fastening to the Boat, Which It Leaves on an Even Keel and Safely Away from the Ship's Side

60 per cent of the earth to the field. The rest goes on a conveyor to a separating device somewhat like that of a thresher, where 20 per cent more soil is reclaimed. The residue then passes into a big revolving sieve, through which all the dirt falls, while the weeds are hoisted into a conveyor and elevated to a wagon. The machine weeds three to five acres a day.

## WOODEN BLOCKS TIED TO FEET TO SAVE SHOE LEATHER

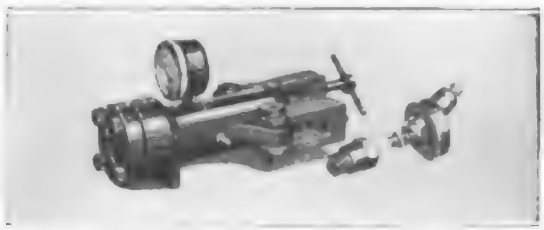
Coconut and other vegetable oils are scattered so freely over many of the docks on our western coast that the leather shoes of the workers are soon corroded and ruined. The photograph shows how the inspector saves his shoes by the simple expedient of tying blocks of wood beneath the soles. Over notches in each block pass cords or straps by which the wooden soles are secured to the feet.

## LIFEBOAT-LAUNCHING DEVICE TO PREVENT SEA DISASTERS

Many lives have been lost at sea through the inefficiency of lifeboat-launching apparatus, which, though it requires skilled manipulation, sometimes fails to operate, and frequently dumps passengers into the water, or allows the boats to be crushed by the waves against the side of a vessel. These disadvantages are declared to be absent from a device being manufactured in Canada, in which two long steel arms replace the familiar davits, while steel tackle, operated by hydraulic machinery, supplants the maze of ropes and pulleys now in use. Pivoted on the rail of a ship, the contrivance is intended to lift a lifeboat from an upper deck, swing it free from the side, no matter what the list, and lower it evenly to the water. Three levers on the loading deck control the mechanism. The tackle is fastened to the boat in such a manner that it can be detached instantly by one person.

## SPARK-PLUG TESTER INCLOSES WHOLE PLUG IN CHAMBER

For correct conclusions, spark plugs should be tested under working pressure. The difficulty hitherto has been to prevent leakage of pressure around the plug seat. A Chicago inventor cuts the knot by inclosing the whole plug in a sealed chamber, with air-tight electrical connections, a lens for observation, and a pressure gauge. The pressure is maintained until the test is completed.



Spark-Plug Tester Which Incloses the Whole Plug in a Pressure Chamber, with Connections Sealed In: A Lens in the End Permits Observation

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

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## WINDSHIELD SCREEN PREVENTS ENTRANCE OF INSECTS

One by one the discomforts of motoring are being eliminated through the invention of automobile accessories. A recent contribution is a screen for preventing insects from passing under the windshield of a car, but permitting the entrance of air. Fine wire mesh is inclosed in a metal frame, the latter being so hinged that it is pushed into place when the bottom section of the windshield is pulled inward.

The Fine Wire Mesh in This Accessory to the Windshield Keeps Out Insects While Admitting the Air. It is Shown Here in Front and Rear Views

## INSULATED AIRPLANE CABIN BECOMES BUSINESS OFFICE

The first public demonstration of a new English commercial airplane was featured by the ascent of a stenographer, with typewriter and notebook, as one of the three passengers. While the roaring 12-cylinder engine pulled the plane through the air at 90 miles an hour, letters were easily dictated and typed in the quiet cabin. The cabin, by the way, is typical of the sort being provided in the new peace-time machines. A double bulkhead, filled with asbestos, forms the front and serves as insulation against both the heat and noise of the engine. Free from wires and cross braces, the entire cabin is devoted to chair space and "leg room" for the three passengers carried.

This English Limousine Airplane Is a Four-Seater Designed for the Use of Business Men. Bodily Comfort Consequently Receives First Emphasis in the Cabin Construction. Upholstery Is Luxurious and Leg Room Ample. A Double Bulkhead Insulates against Both the Heat and Noise of the Engine. At the Right is Pictured the Stenographic Demonstration Which Was a Feature of the First Flight

## GERMAN STEAMER "IMPERATOR" KEPT BY UNITED STATES

The giant steamship "Imperator," former German liner and second ship in the world in size, is to be kept by the United States, to which it was allocated by the Interallied Shipping Commission, and will be placed in passenger service when repairs are completed. Seven other German ships also are to be retained. The "Imperator" was launched in 1912, and was described in Popular Mechanics Magazine for August of that year. It is 900 ft. long, 96 ft. of beam, and makes 25.9 miles an hour. Its capacity is 4,250 passengers, besides the crew.

## LEATHER FROM FISH SKINS BY NEW CURING PROCESS

Fish leather will become a useful and economical covering for books, belts, wallets, novelties, etc., with the commercializing of a new process discovered by a New York inventor. The fish skins are dried, sandpapered smooth, salted, pressed by hot irons between oil-soaked blotters, and then treated by chemicals whose nature is not divulged. The leather thus prepared is tough, durable, and very pliable. Of the varieties of skin experimented with, that of the conger eel gave the best results, the blackfish and common eel claiming second and third place, respectively. Vast quantities of this material go to waste every year when the market fishermen clean their catches.

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Concrete Pit for Storing Coal under Water: Its Capacity Is 6,000 Tons and It Is 204 Feet Long, 62 Feet Wide, and 18 Feet Deep, Lined with Concrete. In This Picture Workmen are Seen Laying the Concrete Floor

# SLACK STORED UNDER WATER IN VAST PIT

By GEORGE F. PAUL

SPONTANEOUS combustion in great piles of stored slack coal has been successfully overcome at Omaha by the building of a great concrete-lined pit where 6,000 tons of coal can be kept under water. This pit holds the fuel for one of the pumping plants of the Metropolitan Water District. It is 62 ft. wide by 204 ft. long at the top, and has a depth of 18 ft. As the site consisted of clay, the greater part of the excavation work was done by the use of a locomotive crane with a clamshell bucket that discharged into a hopper from which the wagons were loaded. Nor is hand shoveling needed in connection with the use of the pit. A locomotive crane with a 60-ft. boom is used to unload the coal into the pit and also to carry it up from the pit and into the boiler room. Freezing in winter can be avoided by draining off water until it is about 3 ft. below the surface of the coal.

The Pit Sides Are Vertical for Eight Feet Down, Then at 45 Degrees, Necessitating the Position of the Concrete Mixer and Chute Seen Here

The pit has a concrete floor 8 in. thick, and the sides rise with a 45° slope to a height of 10 ft., the remaining 8 ft. being vertical. The top of the pit is 2 ft. above the ground level. A light galvanized-iron roller was used to spread and finish the floor concrete. By fitting this roller



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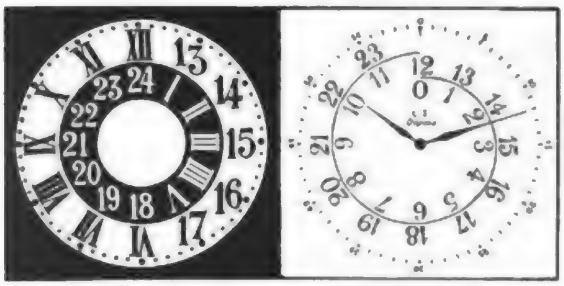
with a long handle it could be operated by one man and there was no need for anyone to walk over the concrete. The mixer was elevated so that the concrete could be conveyed by gravity into a hopper and thence into two-wheeled buggies used to carry it along board tracks to the points where concreting was going on, while the locomotive crane was kept busy handling the materials, unloading the cars of sand and gravel, and moving the piles so as to shorten the wheeling distance. Thus quick and economical construction was insured.

The pit is expected to pay for itself many times over in the safety secured and the efficiency that it makes possible.

## DIVIDE NEW TIMEPIECE DIALS INTO TWENTY-FOUR HOURS

The adoption of the 24-hour system of time measurement in France has resulted in the production of several novel de-



BY COURTESY OF THE JEWELERS' CIRCULAR

**Left, 24-Hour Clock Dial with Black Field for the Night Hours, and White Field for the Day. Right, a Spiral Arrangement of the Numerals**

signs for watch and clock faces. Probably the simplest of these is one in which figures are arranged on both sides of a spiral line, beginning at zero, designating midnight, and running to 23, one hour before midnight. The ends of the line are above and below the figure 12, which indicates noon. In another, the figures are arranged in two circular fields, one black and the other white, the latter surrounding the former. Figures in the black field designate hours of darkness, while those in the white field number the hours of lightness. Roman numerals are used for the hours between midnight and noon, and Arabic numerals for the remaining 12 hours.

¶An aerial mail service between the United States and the West Indies has been promised by the second assistant postmaster-general. He recently sailed for Havana to make arrangements.

## THIRTY-SIX FRUIT VARIETIES FROM ONE OLD APPLE TREE

An old back-yard apple tree in an Ohio city is yielding, in rotation, crops of apples of the extra-early, early, medium-early, fall, and winter varieties, besides seven kinds of pears—a total of 36 varieties of fruit. The tree, more than 75 years old, was thought to be dead and in an advanced stage of decay, when the horticulturist responsible for its metamorphosis began his experiments. Skillful and studied grafting, of course, accomplished the seeming miracle. The renewed tree is now vigorous enough to produce some 40 to 50 bu. of fruit every year, all of the choicest kind. Its owner declares that yielding several varieties of fruit at different seasons makes a healthier tree than the usual production of a heavy crop all in one season.

## CHICAGO PARK ANNEX BUILT OUT IN LAKE MICHIGAN

Lincoln Park, one of Chicago's largest playgrounds, has been made still larger without decreasing the land holdings of any neighboring property owner. The addition, just opened to the public, consists of an island, wholly of made land, about 600 ft. out from the Lake Michigan shore, with which a single bridge connects it. The artificial island is about half a mile long, and contains 25 acres. Work on it was started in 1910, but the cover of trees and grass already established gives it a much older appearance. The outer shore line is distinguished by a concrete-paved bathing beach.

## ILLUMINATED FOUNTAIN PEN CARRIES OWN BATTERY

In the tube of a fountain pen not extraordinarily large, a New York inventor finds room for the necessary ink well, a tiny incandescent lamp, and a miniature electric dry battery. The light shines out under the point of the pen, its source re-

**Electric-Lighted Fountain Pen, Disassembled: The Pen Section, Lamp, Ink Well, and Battery Section are Seen in Order**

maining invisible to the user's eyes, while it illuminates the spot of paper over which the pen is traveling.

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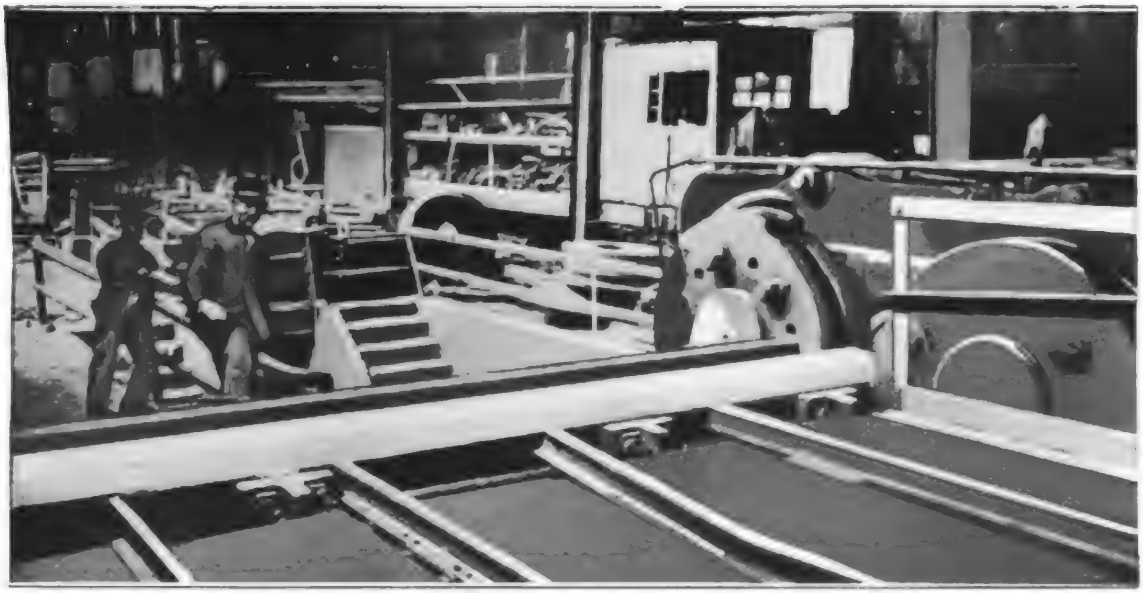
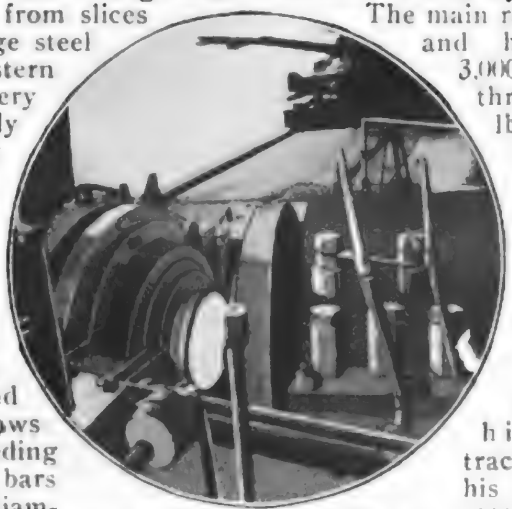


The Ponderous Machine Which Cuts Slices from the End of a Huge Steel Bar, and Makes Them into Wheels: The Bar to be Worked Stretches across the Picture to the Great Cutting Wheels at the Right

## HUGE MACHINES FORM WHEELS DIRECT FROM BARS

Wheels and disks are now being made by the rolling process from slices cut off the ends of huge steel bars, in a large eastern steel mill. The machinery used is exceptionally massive. The cutting machine weighs 850,000 lb., and is 36 ft. long, 18 ft. wide, and 13 ft. 6 in. high, with a feed table 60 ft. long. Heavy, eccentric cutter disks on 24-in. shafts slice off the end of the bar, the jaws approaching and receding as they revolve. Round bars from 11 to 20 in. in diameter are cut in eight seconds. The rolling dies are mounted on the facing ends of shafts placed at a slight angle, and the blank is inserted and pressed between them. The rolling machine weighs 800,000 lb., and measures 40 ft. by 18 ft., by 14 ft. high. The main ram is 38 in. in diameter, and hydraulic pressure at 3,000 lb. gives it a total thrust of about 3,000,000 lb., the roller thrust bearing being 44 ft. 8½ in. in diameter. The operation of rolling the disks, taking from 20 to 60 seconds, requires 1,000 to 2,000 hp. from the driving motor.



The Huge Ram That Forms the Disks, Mounted between the Ends of Shafts That Come Together at a Slight Angle: This View Gives a Good Idea of the Machine's Massive Construction

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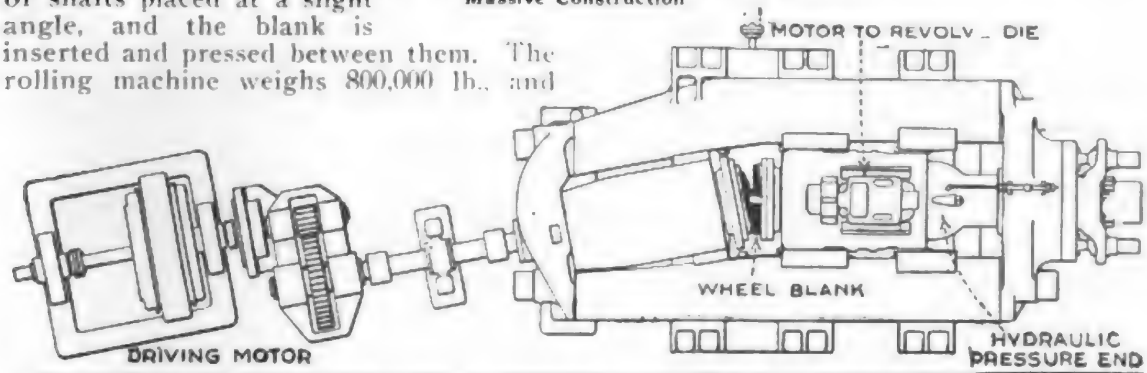
¶An Ohioan believes himself the first contractor to have inspected his work from the air. He recently flew above a long stretch of brick roadway which was nearing completion.




The Ram and the Wheel-Forming Die are Operated by Separate Electric Motors, as the Diagram Indicates. The Wheel Blank is Placed Where the Two Great Surfaces Meet, and is Quickly Rolled to the Desired Shape



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## BIG WOOD INCLINE FOR AUTOS TEMPORARY BOULEVARD LINK

When the work of completing the connection of north and south-side boulevards in Chicago was held up by conditions of labor and material, the impatient engineers decided to expedite matters and relieve traffic congestion in a novel way. North-bound autoists early this fall found a surprise awaiting them in the shape of a huge incline of wood, bridging the unfinished section and offering a new way out of the business district. The incline is 200 ft. long, 20 ft. wide between rails, and rises 13 ft., making an easy 6½-per-cent grade. The big structure was completed in an actual working period of 48 hours, and gave immediate relief to the traffic situation.

**Looking North along Chicago's New Boulevard Link, Now in Process of Construction: The Huge Wooden Incline, Installed for the Temporary Convenience of Autoists, is Seen in the Middle Distance**

## GLUING VENEER MOIST GIVES BETTER RESULTS THAN DRY

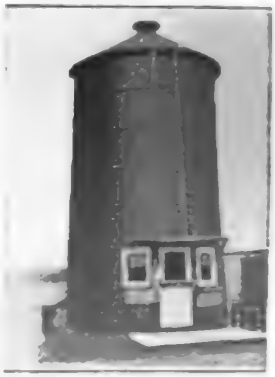
That veneer for paneling and plywood may be glued without the usual process of removing its moisture, and even better results obtained than with preliminary drying, is the discovery of the U. S. Forest Products Laboratory. Casein or other water-resisting glue is used. It is also found that the season for cutting timber, contrary to established notions, has practically no effect on its value or durability. The only important factor is the care of the wood after cutting.

## ITALIAN WARSHIP RETRIEVED FROM SEA BOTTOM

Keel uppermost, her thirteen 12-in. guns imbedded in the sea bottom, the Italian superdreadnaught "Leonardo da Vinci" for months resisted all attempts at salvage. It will be recalled that the great ship was sunk at its anchorage by order of its own commander when the explosion of a clockwork bomb threatened the powder magazine, and with it the safety of a dozen near-by warships. As it filled with water, the great steel hull turned over and settled on the bottom. Because of its position, salvage at first seemed impossible. Yet in the face of enormous difficulties divers at last reached and rescued the heavy cannon. Thus lightened, the hull was tightly sealed while powerful pumps injected compressed air. This treatment brought the hull to the surface, the keel still uppermost. Recently, herculean efforts have restored the pride of the Italian navy to normal position, however.

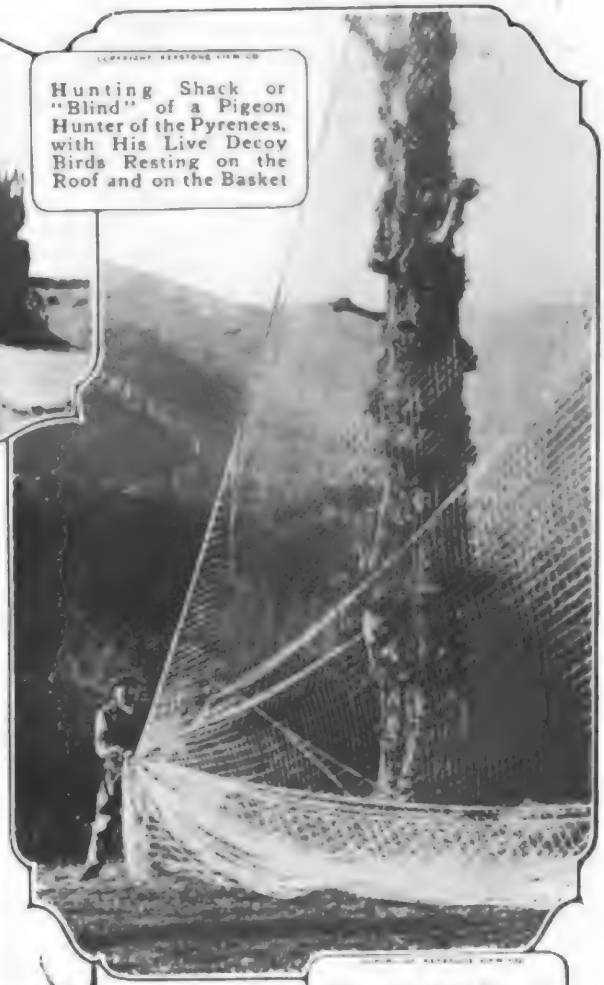
## OLD SILO IN RAILROAD YARD HOUSES LITTLE STORE

Like a stranger in a strange land, a weather-beaten silo stands alone in a western railroad yard. But even odder than its being there at all is its present use as a store. Situated among the many tracks, but on a street used daily by 16,000 packing-house employes, it has become an "all around" store where every sort of trinket, candy, or magazine can be purchased. Its legless proprietor believes that no other store in the world is housed in a similar structure.



# PIGEON HUNTERS OF PYRENEES USE ODD METHODS

Hunting Shack or "Blind" of a Pigeon Hunter of the Pyrenees, with His Live Decoy Birds Resting on the Roof and on the Basket



The Live Tame Birds Used as Decoys are Taken into the Forest by the Hunters, Where Their Presence and Seeming Unconcern Invites Their Wild Cousins in Great Numbers to the Nets or the Guns, as the Method of the Day may Be

Huge Nets are Spread from the Ground to the Tops of Dead Trees, and the Birds are Driven into Them. Once Entangled in the Meshes, There Is No Escape for Them

Each Hunter Carries a Supply of Disks, and When the Nets are Spread, He Sails the Round Missiles into the Flocks Until the Frightened Pigeons Fly Straight into Captivity



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## USE HOUSE-MOVING METHODS TO TRANSPLANT BIG TREE

Transplanting a full-grown tree was accomplished near Detroit recently by applying house-moving methods to the task.

Big Tree Moved by Incasing Its Roots, Jacking Up the Platform Underneath, and Working It to Its Destination on House Movers' Rollers

A circular trench, about 25 ft. in diameter and several feet deep, was dug around the tree with the trunk as its center, and the soil surrounding the roots was inclosed by vertical staves, bound with cables. Under the earth thus held together a platform of heavy timbers was placed. The tree and its root soil were then elevated with jacks, allowing rollers to be inserted between the platform and wooden tracks which were laid on the ground. An ordinary horse-actuated capstan was employed to pull the tree, a large ditch being excavated for the passage of the load, which weighed approximately 125 tons. Over two weeks were required to move the tree 141 ft. from its original location.

## LOGS SHOOTING LONG CHUTE SET AFIRE BY FRICTION

The curious spectacle of great logs set afire by the friction of their rapid descent in a long chute was witnessed recently in the mountains of Washington State. Logs of exceptional length were needed for special water-front piling, and could be found only at a great height. The chute down which the cut timbers were slid was over a mile long, and the big sticks attained a tremendous velocity. One that "jumped the track" on the way, shattered a 24-in. oak tree in its course, without material damage to itself.

## SELF-THREADING HAY PRESS HAS MANY IMPROVEMENTS

A hay-baling machine recently brought out by a Kansas concern has a number of new features that reduce the amount of labor usually required for the operation. The machine is so low that it may be fed from the ground, permitting its use in the field or on the barn floor. The open side of the feed hopper is reversible, taking from either right or left, and the long-stroke feeding bar pushes each charge of hay into the baling

General View of Self-Threading Hay Press, in Which the Long-Stroke Feed Bar and Open-Side Hopper may be Noted; The Insert in the Corner Gives a Detail View of the Wire-Threading Mechanism for Binding the Bales

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chamber without manual assistance. A novel attachment is the self-threading needle bar, which, when the operator thrusts it through the machine, catches and returns the baling wire ready for tying, and this operation is quickly completed. Two different sizes are run by six and eight-horsepower gasoline engines.

## LOFTY STEEL SIGNAL TOWER WILL WARN OF STORMS

Ships far out at sea will be warned of approaching storms night and day by signals displayed on a lofty steel tower recently erected by the Weather Bureau at San Pedro, on the California coast. The structure is 75 ft. high and is located on the roof of a seven-story building, making the elevation of the top of the tower over 150 ft. above the level of the water. Regulation flag signals will be employed in the daytime to indicate weather probabilities, and at night red and white electric lanterns will be hoisted. The direction of the wind will be told by the arrangement of the lanterns or flags. An electric searchlight is mounted at the base of the tower. It will also serve as a beacon to guide vessels into the harbor near which the structure is situated.

## STREET-SPRINKLER WAGONS HAUL WATER TO HORSES

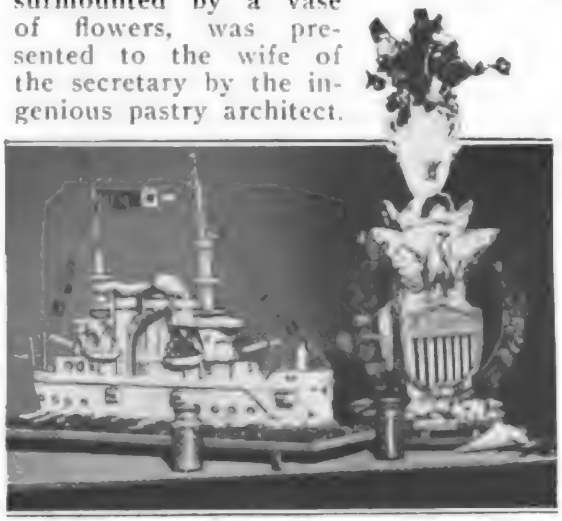
When state authorities decided recently that water troughs were inimical to the health of horses, and decreed their abolition in New York City, an organization interested in the welfare of animals adopted a novel means of supplying the beasts with drink. Discarded street-sprinkler wagons were put into service by removing the spraying device at the rear and installing in its stead a pipe equipped with a number of faucets. The tanks, which hold 600 gal., are filled at street hydrants, and driven to steamship docks and railroad depots, where horses are compelled to stand while the trucks they draw are loaded or unloaded. Pails

A Traveling Water Trough: This Is One of Several Converted Street-Sprinkler Wagons Used in an Eastern City for Quenching the Thirst of Horses

carried on the wagons are filled from the faucets by drivers, and taken to the thirsty animals.

## SAN FRANCISCO CHEF MOLDS EXTRAORDINARY CAKES

Sculptors may find cause for envying the San Francisco chef who molded two elaborate cakes which were served at a dinner given by that city in honor of Secretary of the Navy Daniels during a recent visit of the cabinet member. One of these was in the form of a battleship. From the funnels of the miniature war vessel smoke appeared to be issuing, while it rested on a billowy sea of icing. A national shield, made of dough and surmounted by a vase of flowers, was presented to the wife of the secretary by the ingenious pastry architect.



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Cakes Served at a Banquet in Honor of Secretary of the Navy Daniels: A Barrel of Sugar was Required for the Miniature Battleship

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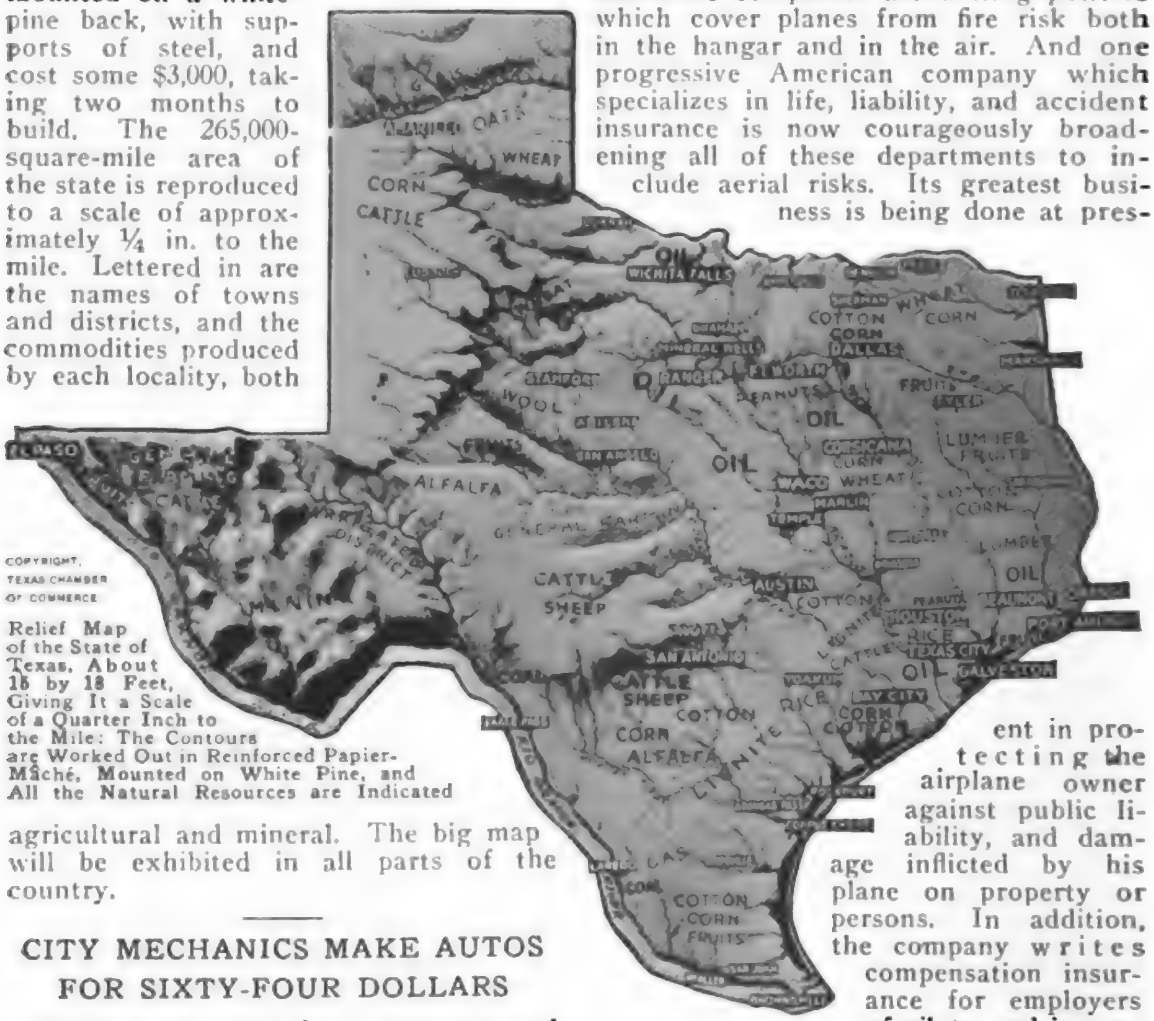
## HUGE RELIEF MAP OF TEXAS SHOWS ALL RESOURCES

A framed relief map of the state of Texas, measuring 15 by 18 ft., and weighing about 2,000 lb., has been prepared to show in detail all the natural resources of the commonwealth. Reinforced papier-mâché is the material used, the contours being worked out with great care. It is mounted on a white-pine back, with supports of steel, and cost some $3,000, taking two months to build. The 265,000-square-mile area of the state is reproduced to a scale of approximately ¼ in. to the mile. Lettered in are the names of towns and districts, and the commodities produced by each locality, both agricultural and mineral. The big map will be exhibited in all parts of the country.

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Relief Map of the State of Texas, About 15 by 18 Feet, Giving It a Scale of a Quarter Inch to the Mile: The Contours are Worked Out in Reinforced Papier-Mâché, Mounted on White Pine, and All the Natural Resources are Indicated

## CITY MECHANICS MAKE AUTOS FOR SIXTY-FOUR DOLLARS

Using parts taken from worn-out and discarded autos, the superintendent and five mechanics of the Cincinnati city garage have completed two new machines at a total cost for purchased material of $64 each. Even the labor was a spare-time item, the workmen enjoying the exercise of their ingenuity as a relief from the routine of caring for 73 municipal cars. By fitting broken wheels with new spokes, hammering bent windshield frames straight, and similar salvaging operations, the call for new material was reduced. The cars show so far a running cost of only 2.2 cents a mile.

## COMPANY WRITES MANY FORMS OF AERIAL INSURANCE

The surest proof that the airplane, as a commercial vehicle, has come to stay is found in the growing disposition of the great insurance companies to cover almost every imaginable risk. Already in this country, although America is behind England in the matter, several fire-insurance companies are writing policies which cover planes from fire risk both in the hangar and in the air. And one progressive American company which specializes in life, liability, and accident insurance is now courageously broadening all of these departments to include aerial risks. Its greatest business is being done at present in protecting the airplane owner against public liability, and damage inflicted by his plane on property or persons. In addition, the company writes compensation insurance for employers of pilots, and is even willing to insure an airman's life for a special premium and a term of one year. But of most interest to the general public is the trip insurance which closely resembles the railroad insurance familiar to every traveler. Like this latter, the aerial-trip ticket carries accident insurance for a definite amount for every possible injury. On the whole this new business of aerial insurance is now on somewhat of a sporting basis, owing to the lack of data, but even so it is proving an invaluable stimulant to commercial aviation.

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# RAIN GAUGE WRITES OWN WEEKLY RECORD

The constant personal attention necessary with the rain gauge formerly used by the U. S. Weather Bureau has resulted in the development of a mechanical instrument which automatically records the time and amount of all precipitation during a period of eight days.

As with the previous type, falling rain is caught in a brass funnel, or "collector," 8 in. in maximum diameter, from which it runs into an upright cylindrical tank. But instead of measuring the water in this tank with a graduated stick, as with the old gauge, the weather man now allows the instrument to keep its own record by means of a float which actuates a pen point against a revolving cylinder.

In more detail, an unstretchable brass chain is led upward from the float and around a small horizontal drum. A counterweight hangs from the other side of the drum, so that the drum shaft turns with every vertical movement of the float. A sliding cam on the shaft transforms this rotation into a back-and-forth motion of the pen point. The latter leaves its trace upon the record cylinder which is turned by internal clockwork through one revolution each day. As the cylinder revolves, the worm shaft which bears the pen point carries it from left to right in eight days. So at the end of this period the weather man learns from the meanderings of a single line every variation of the water level in the cylindrical tank.

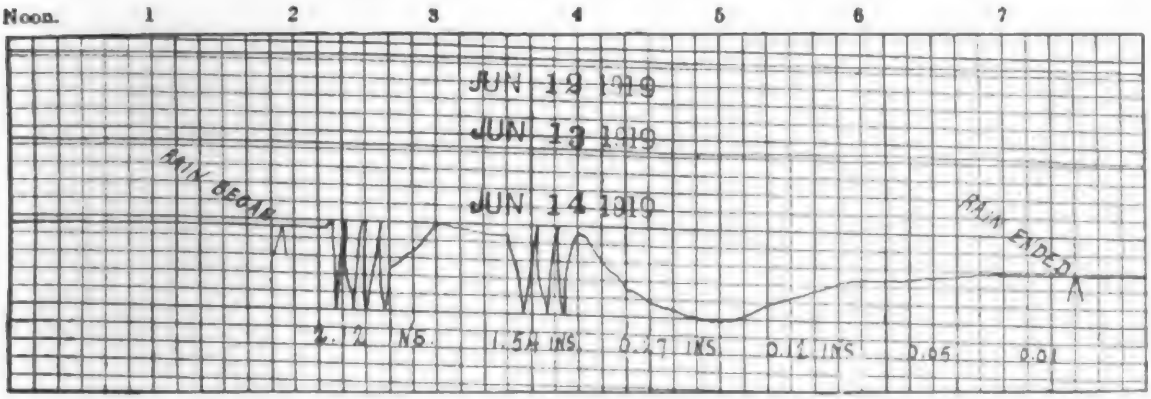
It will be seen from the illustration that the four sides of the copper cover are extended to form a flaring shield for the funnel mouth. This is done to break up the eddying air currents which would otherwise cause a considerable negative error by blowing raindrops from the funnel mouth. For obvious reasons the gauge cannot be used when the temperature is below freezing.

The Weather Man has Tilted Back the Copper Cover to Show the Cylinder on Which is Written the Weekly Record

## CROSSING RIGHTS TO AUTOS APPROACHING FROM RIGHT

At city street crossings where the traffic is not sufficient for the posting of an officer, automobiles approaching each other at right angles frequently encounter a right-of-way problem that may end in an accident. An east-coast city has simplified the question by giving the privilege of first passage to the car coming from the right. In case of collision, the police take the positions of the two cars as evidence, the one coming from the left being regarded as in the wrong. Police officers in the same city regularly visit the schoolrooms and instruct the children in the precautions which rob a street crossing of its dangers.

¶Of the Mexican oil lands, computed to exceed in total area the whole of France, only 1⅓ per cent is under development.




Only Eight of the Twenty-Four Hours are Shown on This Fragment of a Weekly-Record Card. Inspection of the Lower Line, However, will Give an Understanding of the Method Used. Each Vertical Division Represents .05 Inch; and Each Horizontal Division 10 Minutes of Time. So It is Seen That an Inch and a Half of Rain Fell between 3:00 and 4:00 on the Afternoon of June 14, 1919

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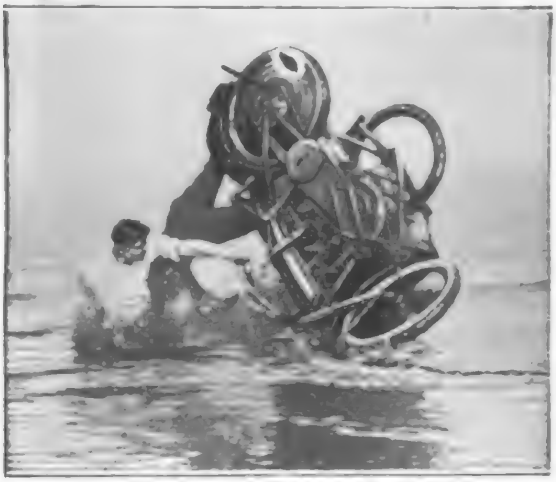
## MOTORCYCLE TAKES TO WATER UPSIDE DOWN IN SPILL

The dangers of high-speed motorcycling on a wet beach were illustrated in



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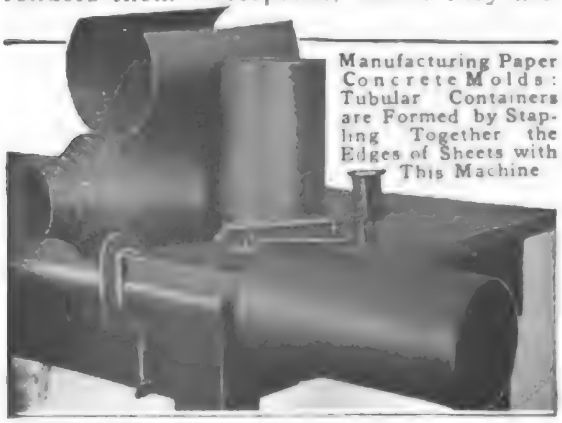
**Motorcycle Accident Caused by Riding at High Speed on a Wet Beach: Machine, Sidecar and All, Took to the Water Upside Down**

spectacular fashion during the recent annual races of a New Jersey club. In the sidecar event, one of the machines struck a hole in the sand, concealed by a pool of water, and the whole vehicle went into the ocean upside down. The rider, by a happy chance, emerged from the adventure practically uninjured.

## CONCRETE TEST CYLINDERS MADE IN PAPER MOLDS

Paper is employed by the Bureau of Standards for making molds in which are cast the concrete cylinders used in tests. Sheets of the material are converted into tubular containers by fastening their edges together with staples, a hand-operated machine performing this task. The molds are dipped in hot paraffin, which renders them waterproof, before they are filled with concrete. Each mold weighs only 7 oz., considerably less than those made of steel, which they have supplanted. The sheets can be nested together for shipment.



Manufacturing Paper Concrete Molds: Tubular Containers are Formed by Stapling Together the Edges of Sheets with This Machine

## NAVY PLANS SEAPLANE TOURS TO BRAZIL AND PHILIPPINES

Working with the information gained from the first transatlantic flight, experts of the Navy Department are now designing a new type of seaplane for fresh adventures next spring. One flight is to be made to Brazil, by way of Hampton Roads, Va., Cuba, Haiti, Santo Domingo, Trinidad, to Rio de Janeiro. More spectacular, however, will be an air journey of 7,000 miles from San Diego, Calif., by way of Hawaii and Guam, to the Philippine Islands, and possibly to Hongkong. The first leg of this last tremendous flight is 2,000 miles long.

## LOG CABIN USED AS OFFICE BY REAL-ESTATE AGENT

Prospective real-estate purchasers have little difficulty in finding the office of a certain California dealer in residence lots,

**Something Out of the Ordinary in the Way of Real-Estate Offices Is This Log Cabin, Which is Used by a West-Coast Lot Salesman**

though his place of business is located on a tract dotted with buildings occupied by salesmen handling the same line. The explanation lies in the office itself, which is nothing more nor less than a log cabin. Because of its unusual appearance on such a site, the structure serves as an advertisement for its owner, and a landmark for persons in search of him.

¶A production of beet sugar this year estimated at 1,750,000,000 lb., coupled with a curtailment of the European crop, places the United States second among the world's producers of that commodity. The cane-sugar crop will not exceed 20 per cent of the total.

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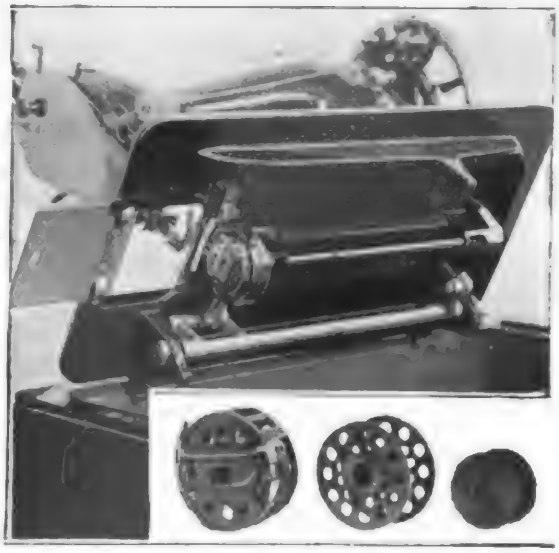
## IMPROVED SEWING MACHINES CUT FACTORY TIME LOSS

It is calculated that the time lost by operators of power sewing machines in factories while changing bobbins will be reduced 80 per cent by a new type of machine. The feature of the device, an Indiana invention, is a very large bobbin, designed to hold enough thread for an hour and 40 minutes of work, instead of the usual 20 minutes. A further reduction of waste time is accomplished by an automatic system of lubrication, doing away with the customary five-minute periods allowed twice daily for oiling, a total saving of some consequence.



Sewing Machine with Extra-Large Bobbin, Saving Operator's Time in Changing: Bobbins are Seen at Bottom in Detail

¶ By underquoting the Japanese more than $9 to the ton, Australian coal exporters are bidding strongly for the Philippine market.

## HUGE CONCRETE DOME CROWNS DANISH THEATER

Limits set on the use of concrete only a brief time ago are being put in the discard with surprising rapidity, so swift has been the progress made in adapting the material to purposes theoretically impractical or impossible in the recent past. A few years back the employment of concrete for domes was opposed by engineers, but a large theater recently completed in Copenhagen, Denmark, shows such construction to be desirable. The playhouse is crowned with a dome 130 ft. in diameter, made of concrete molded with considerably less scaffolding than would have been necessary with brick or stone. Twenty radial steel ribs, braced by three circular beams, form the foundation of the arched roof, which is strongly reinforced and coated with asphalt. Material was hoisted by a crane mounted on top of a lumber

Here can be Seen the Curved Steel Radial Ribs, Supported by the Lofty Tower of Lumber, on Which is Mounted the Crane for Hoisting the Materials

View of the Concrete Dome in a Partly Completed State: The Reinforcing Material Is Visible in the Section against Which the Ladders are Leaning

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tower built in the exact center of the dome. Practically no other scaffolding was necessary.

## WELL COVERINGS IN KANSAS LOOK LIKE TENTS

In western Kansas the winds are strong, and above the farmers' fields the air is often filled with dust and insects and

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**Cone-Shaped Coverings Used to Keep Dirt and Insects Out of Open Wells in the Farm Fields of Western Kansas**

flying débris. To protect the open wells, queer cone-shaped coverings are used, each with a door in the side through which the water can be reached without admitting any extraneous matter.

## AUTOMOBILE PARTS CLEANED WITH JET OF STEAM

Gasoline is an expensive material, but in spite of this it is used in most garages for removing oil and dirt from automobile parts. A more economical method of performing this operation is employed by a repair man in a western city. Parts are placed on a concrete bench, and a jet of steam is applied to them by means of a flexible steel hose. Only a few minutes are required to clean each piece, and little labor is necessary, as one man can guide the hose and manipulate the conveniently located valve which controls the flow of steam. Condensed vapor, oil, and dirt are carried away by a drain in the bench.

**Cleaning Motor-Car Parts with Steam: To the Right of the Workman can be Seen the Valve Which Controls the Flow of Vapor**

## AIRPLANE WITH SUPERCHARGER SETS TWO-MAN ALTITUDE MARK

The airplane-engine supercharger has scored again. In the October number of Popular Mechanics Magazine was illustrated and described this remarkable, constant-power mechanism which enabled Major Schroeder to fly as fast at 18,400 ft. as at ground level. Using again a Le Pere-Liberty biplane equipped with a Moss supercharger, the major has now established a world's altitude record for machines carrying a pilot and passenger. The height attained was 29,000 ft., which is greater by 750 ft. than his own record set on September 6.

## FORECASTING AIR CONDITIONS NEW SERVICE FOR FLIERS

Weather conditions of the upper air and their relation to the safety of flight are now made the subject of special forecasts by the U. S. Weather Bureau, and reports are issued twice a day. Wind velocities naturally are the most important factor, and for their observation small spherical balloons are used. These thin gas bags are inflated to about 26-in. diameter, carefully measured with big wooden calipers, and their "free lifting" power weighed in a sensitive scale. They are then released from some high point and the time recorded. Once a minute the course of each floating sphere is observed through an American-made theodolite, of a form developed especially for this work. From this record a chart is readily prepared which maps exactly the wind direction and velocity at different heights. The reports translate these findings into simple language of few words, sample forecasts reading merely, "Good flying weather," or perhaps instead, "Bad flying weather: showers and thunderstorms, and fresh and strong northwest winds aloft." The reports are telephoned morning and night to the various flight directors.

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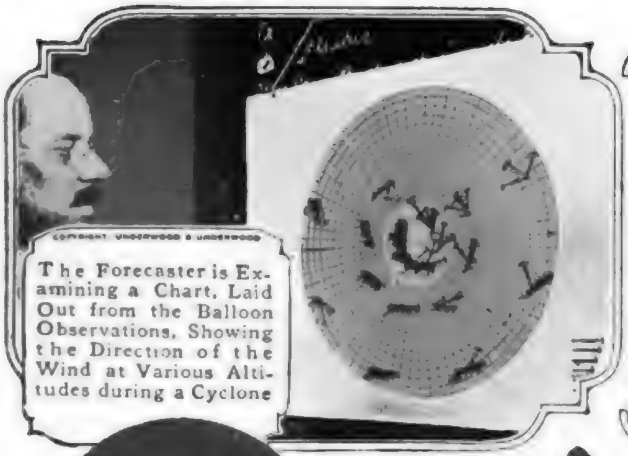
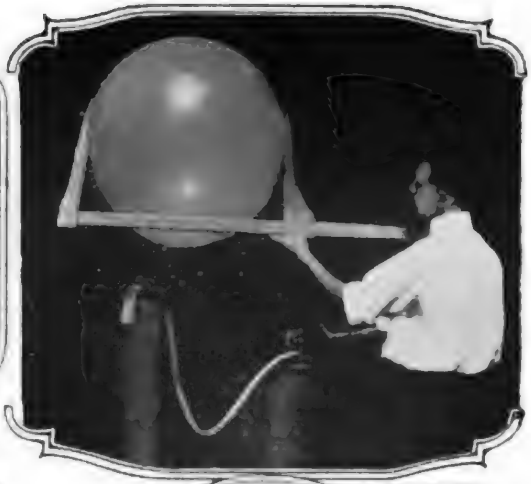


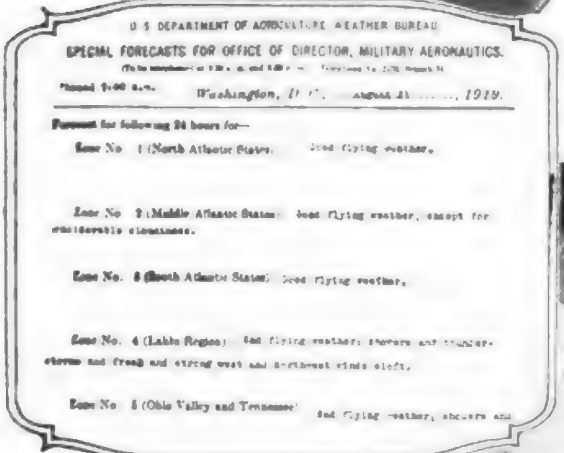
The Forecaster is Examining a Chart, Laid Out from the Balloon Observations, Showing the Direction of the Wind at Various Altitudes during a Cyclone



Observer Weighing the "Free Lift" of an Inflated Balloon on a Pair of Sensitive Scales, So That the Correct Computation can be Made When the Little Gas Bag is Sent Aloft to Try the Air

Measuring, with Wooden Calipers, the Diameter of a Balloon being Inflated, Preparatory to Its Release for Indicating the Direction and Velocity of Air Currents

Observer Releases the Balloon at a Given Instant, Timing It Carefully; the Other is Preparing to Take Notes on the Direction and Speed of Its Changing Course



U S DEPARTMENT OF AGRICULTURE WEATHER BUREAU

SPECIAL FORECASTS FOR OFFICE OF DIRECTOR, MILITARY AERONAUTICS.

Issued 9:00 a.m. Washington, D. C., August 21, 1919.

Forecast for following 24 hours for—

Zone No. 1 (North Atlantic States): Good flying weather.

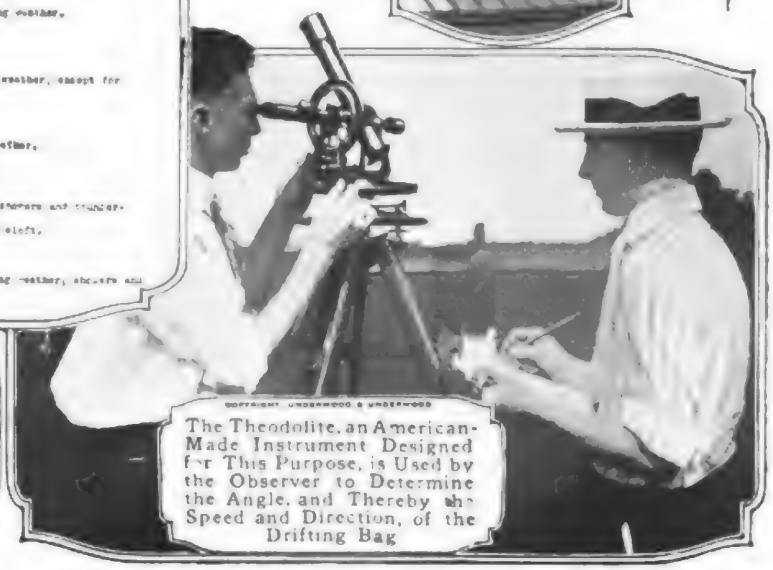
Zone No. 2 (Middle Atlantic States): Good flying weather, except for considerable cloudiness.

Zone No. 3 (South Atlantic States): Good flying weather.

Zone No. 4 (Lakes Region): Bad flying weather; showers and thunderstorms and fresh and strong west and northwest winds aloft.

Zone No. 5 (Ohio Valley and Tennessee): Bad flying weather, showers and

Part of a Typical Report Sheet, Made Up from the Chartings of Balloon Flight and Translated into Simple Language: It is Telephoned to Flight Directors Morning and Night



The Theodolite, an American-Made Instrument Designed for This Purpose, is Used by the Observer to Determine the Angle, and Thereby the Speed and Direction, of the Drifting Bag

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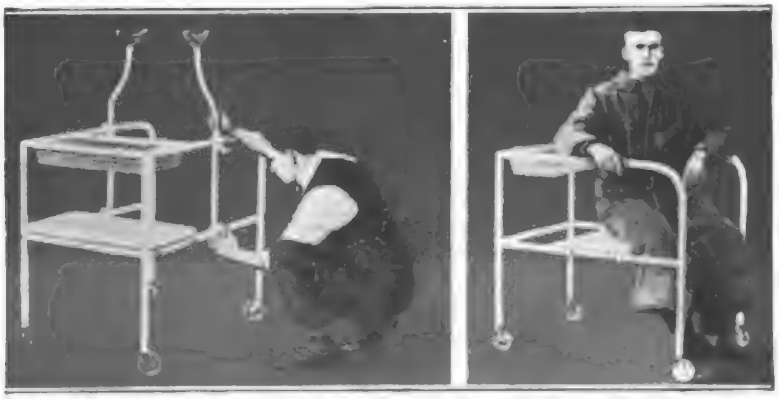
## SICK-ROOM WALKING CHAIR STRENGTHENS SHAKY LEGS

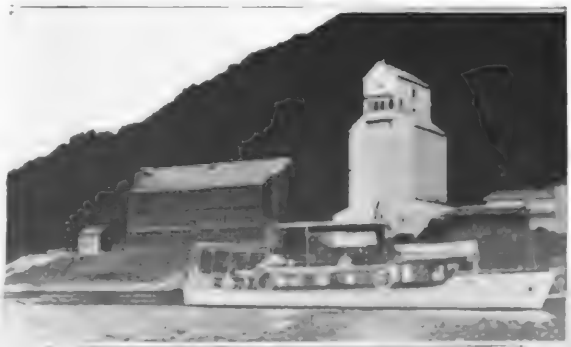
Hospital attendants frequently find that a patient requires quite as much attention when convalescing as when desperately ill. He must have that magazine, or wants that light turned on. Later he must be helped into and out of his wheel chair; finally he demands the help of an orderly in learning to balance himself on his legs once more. But many hospitals now escape these difficulties by providing the convalescent with a new "walking chair," which not only enables a patient to do for himself, but requires him to use and thus rebuild his muscles. Made of light steel tubing and rolling on ball-bearing casters, the chair is easily pushed along the floor. When the patient wishes to sit down he finds it easy to pull a sliding cane seat into place. Adjustable crutches may be fitted to the chair during the earlier stages of convalescence. The patient is thus placed on his feet days before he could use ordinary crutches.



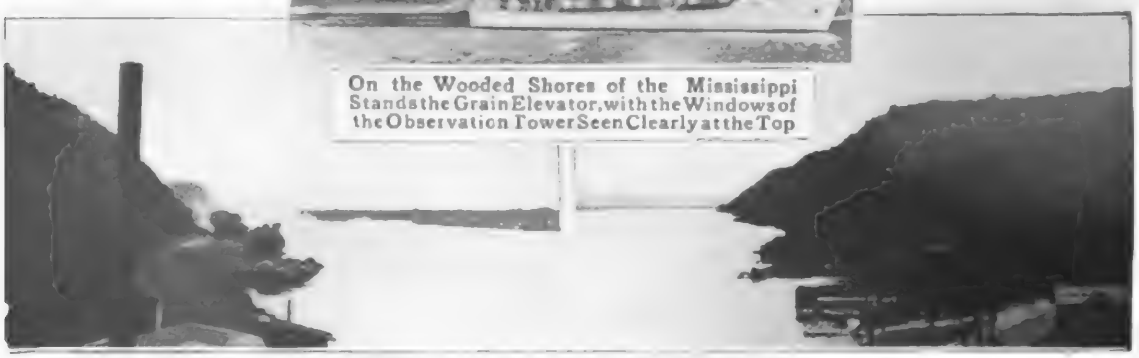
This Walking Chair Quickens Convalescence by Encouraging the Patient to Wait upon Himself. In the Earlier Stages Crutches are Fitted to the Framework, as at the Left. The Sliding Chair is Pulled Forward, as at the Right, When the Patient Grows Tired

## GRAIN-ELEVATOR TOWER IS SCENIC OBSERVATORY

Like his father before him, an Iowa grain dealer has worked his way to success and happiness in a village on the banks of the Mississippi. Love of the wooded hills and broad river being thus his heritage, he was oddly inspired during the construction of his newest grain elevator. Into the cupola, a hundred feet or more above the water's edge, he ordered the construction of a spacious room and broad bow window, with the result that visitors to the elevator are now lifted in the "hoist" from the dust-whitened rooms below to a sunlit observation parlor at the top. Here they find rugs, a table, and comfortable chairs. Stepping to the windows they look down upon the Father of Waters as he twists among the hills, past tree-clad islets. To the south they see the proposed Mississippi Valley National Park, full of historical and scientific interest.



On the Wooded Shores of the Mississippi Stands the Grain Elevator, with the Windows of the Observation Tower Seen Clearly at the Top



Looking North and South from the Broad Bow Windows of His Observation Room, the Grain Dealer is Rewarded by These Views of the Mississippi. The River at This Point Is About Three-Quarters of a Mile Wide; Its Course is Broken by Tiny Tree-Clad Islets and Confined by Wooded Banks That Rise as Graceful Hills

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## PREHISTORIC ESKIMO VILLAGE UNEARTHED BY SCIENTISTS

A whole village of Eskimos of a prehistoric tribe, buried in the everlasting ice of latitude 75°, has been discovered by a scientist who, for almost two years, has been excavating in the vicinity of Barrow Point, on the north shore of Alaska. The bodies of 80 inhabitants of the ancient settlement were unearthed, and several have been sent to the museum of an eastern university. That the period of their life corresponded with the "stone age" is demonstrated by the shape of their heads.

## PLANES FLY IN FORMATION UNDER NEW YORK BRIDGES

Like small boys at a game of "follow the leader," three airplanes recently flew together under the five bridges which span the East River in New York City. They circled high above the first bridge in triangle formation, then glided smoothly beneath. Emerging on the other side, they "zoomed" for altitude, then glided beneath the next. This graceful maneuver was repeated for each of the five bridges.

## CONCRETE WATER TANK BUILT IN ATTRACTIVE TOWER

A concrete water tank recently completed at the Balboa, C. Z., railroad yards, bears no resemblance to the structures of wood or steel ordinarily used for this purpose. Externally the container is a square tower, nearly 44 ft. high, surmounted by a castellated parapet, which relieves the otherwise plain appearance of the structure and artfully conceals its nature. The tank inside is 22 ft. in diameter and 19½ ft. high, and is supported about 40 ft. above the level of the tracks by the walls. Its capacity is 59,500 gal. Valves for controlling the flow of water into and from the tank are housed in the lower portion of the tower. Twenty-four tubular piles, filled with concrete, serve as a foundation for the building, which was erected on reclaimed swamp land. Some of these supports are 50 ft. long.

## TINY MOTOR ON DENTAL TOOL WEIGHS BUT FOUR OUNCES

What is claimed to be the smallest practical power motor in the world, and looks the part, forms the electrical portion of a new dental-tool holder. The motor weighs only four ounces, and is but 1¼ in. in diameter and 2½ in. long. With its gearless, vibrationless shaft extension for holding the drills and buffer, the over-all length is 7 in. The complete tool is held like a fountain pen, a foot-operated controller regulating the speed from 600 to 3,000 revolutions a minute. It may be plugged into any lamp socket.

## BUILDING-CAMPAIGN DINNER ANNOUNCED BY BRICKS

Pasted on bricks, ordinary bricks, were the several hundred invitations recently issued for a large dinner meeting of workers in a building-fund campaign. Neatly wrapped, addressed, and stamped, the strange messages made a heavy load for the truck which bore them from campaign headquarters to the New York City post office. Here they were declared to be the queerest invitations ever sent through the mail.

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Wrapped, Addressed, and Stamped Like Ordinary Letters, the Hundreds of Bricks Shown Above were Recently Mailed as Invitations to a Meeting of Workers in a Building-Fund Campaign. One of the Odd Missives is Shown at the Left

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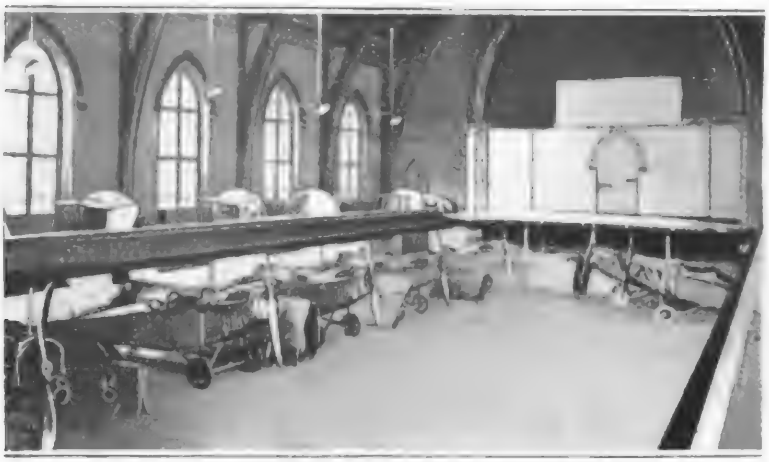
## CHURCH AUDITORIUM IS IDEAL AIRPLANE-DISPLAY ROOM

The ample floor space, large windows, and many hanging lights of an old Chicago church building are responsible for its present use as an airplane-display room. Before securing the church building, the dealer found it difficult to maintain adequate stock in his down-town location, but the generous accommodations of his present salesroom enable him to keep on hand a sufficient reserve of planes. He handles biplanes formerly used by the Canadian government for training purposes, and so far has found their sale an easy matter.



An Automobile Dealer Who Sells Airplanes as a Side Line Considers This Auditorium of an Old Church Building an Ideal Display Room. Floor Space Is Ample. Wide Windows and Electric Lights Provide Illumination

## WALNUT-HARVESTING DEVICE SIMPLE IN OPERATION

Gathering walnuts from the ground is made less laborious by an ingenious device recently patented by a Californian. On the end of a stick, about 3½ ft. long, is fastened a flaring container of galvanized sheet iron, in the bottom of which is a hole large enough to admit a walnut. Four wires, running down the outside of the vessel, terminate in loops at this hole and form an elastic ring, which enlarges when pressed down on a nut, and closes after the latter has passed into the container. When the funnel is filled, it is emptied into a larger receptacle.

## TEST PRESERVING METHODS FOR ROOF TIMBERS

Roof timbers in buildings where high humidity is the rule have been a source of trouble to operators of paper and cotton mills, and other industries, because of their tendency to decay rapidly. In order to determine the best means for preserving such timbers, the Forest Products Laboratory at Madison, Wis., has conducted a series of tests of the various treatments. As a result, it was recently announced that the pressure method, with either creosote or a zinc-chloride solution, will give better results than steeping, dipping, or painting. Twenty years may be added to the life of the wood by this treatment, it is declared, though it is admitted to be the most expensive. Each cubic foot of timber should receive 8 to 12 lb. of creosote, or ½ lb. of zinc chloride, if the latter is used.

## WOMAN DONS ARMY GAS MASK WHILE PEELING ONIONS

Peeling onions is an eye-torturing operation, as every housewife knows from painful experience. This disagreeable feature of the task is eliminated by an Ohio woman, the mother of an over-sea veteran, who wears the gas mask her son brought back from France when she pares the over-fragrant bulbs. She has learned to adjust the device to exclude the fumes in a remarkably short space of time, and declares it to be a perfect protection for the eyes.

¶ Waste land at the sides of 4,000 miles of improved roads in New York State will be planted to fruit and nut trees, and alfalfa, if a plan suggested by the highway commissioner is carried out.

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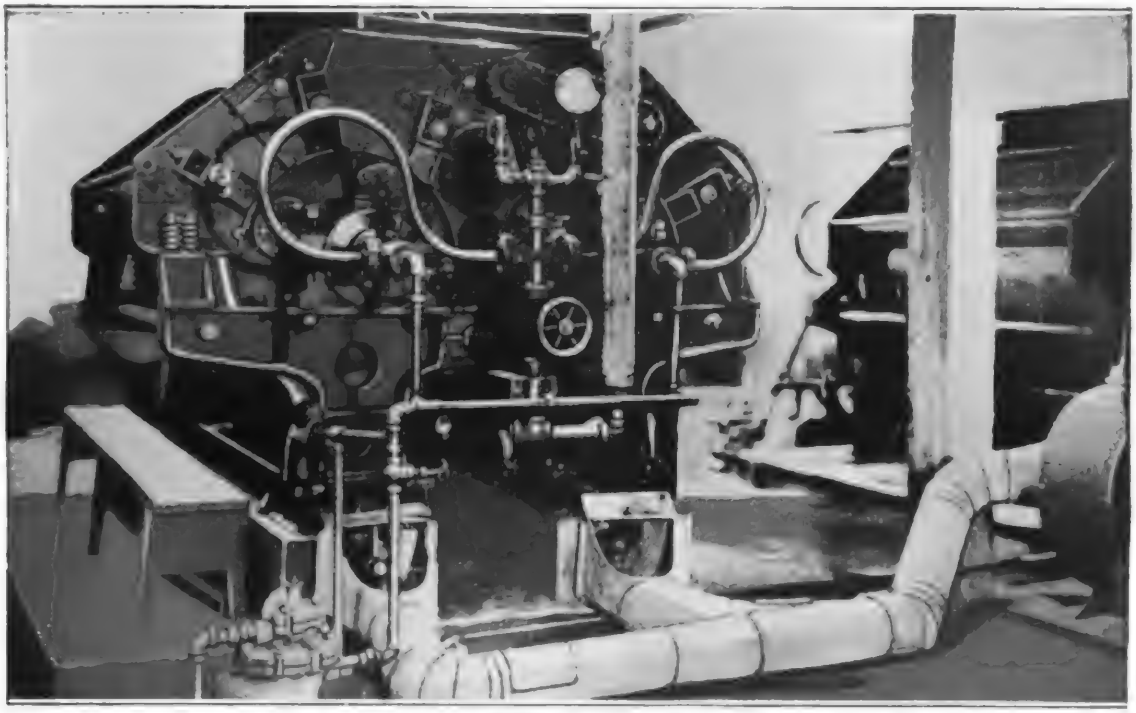
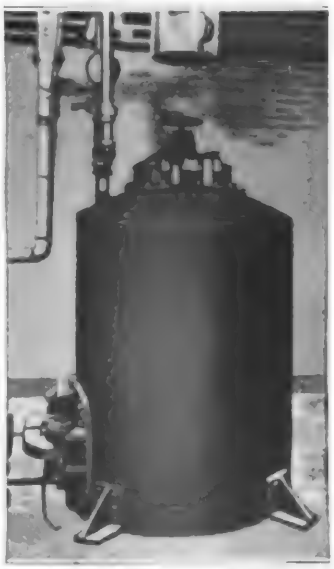


Cooked Potatoes Passing through This Machine are Peeled, Their Skins and Pulp are Separated, and the Latter Emerges in Dried Flakes, Ready to be Ground into Flour. The Picture Shows the Discharge End of the Device

## POTATO-FLOUR PRODUCTION BECOMING IMPORTANT

Potato-flour mills, started during the war to supply the demand for a wheat substitute, have become factors in the food-supply problem of the nation, and economic authorities predict a future of growing possibilities for the industry. Before the United States entered the world conflict, there was not one plant in this country for the production of potato flour on a large scale. At the present time there are several of importance in operation, and their output is represented by figures of considerable magnitude.



Steam Cooker: After 25 Minutes in the Steel Tank, Potatoes Are in Condition to be Placed in the Drying Machine. Only Imperfect Tubers are Utilized

One of the larger mills is located in an Idaho city. It is notable not only because of the amount of flour produced there, but on account of the character of the raw material utilized. Only imperfect potatoes, which could not be marketed in their natural state, are used. Naturally, the cost of these is less than that of more perfect tubers, and the resultant flour is sold at a lower price than would be possible otherwise. The manufacturing process used in the Idaho mill is extremely simple. After being thoroughly washed, the potatoes are placed in a steam cooker having a capacity of 1,000 lb., where they remain for 25 minutes. Following this, they are sent to the drying machine, which first chops the cooked vegetables into a pulp, then separates the skins from the bulk of the potato, and finally dries the pulp so that it is ready for the last operation, that of milling. Grinders of special construction are used for converting the flaky material which comes from the drier into fine-grained flour. The skins of the potatoes have been found suitable for feeding to cattle or hogs.

Six other potato-flour mills are located in various parts of the country. One of these, operated in a

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southern state, makes sweet-potato flour, utilizing a large crop of that vegetable grown in the district. The output of all of these mills is 40,000 lb. of flour daily. About 5 lb. of potatoes are required to manufacture 1 lb. of flour.

## EXTRACTOR FOR FRUIT JUICE IS ELECTRICALLY DRIVEN

The old-fashioned lemon squeezer has gradually developed until now, in a form just introduced, it is run electrically and extracts a whole gallon of orange or lemon juice in five minutes. The new utility is made of noncorrosive white metal, with the motor in the base, and all parts that contact with the fruit are instantly removable for cleaning. In operation, the fruit, cut in half, is simply pressed down upon the rapidly revolving bulb at the top, and the juice promptly issues from a spout at the side. Three sizes of bulbs are supplied. The machine is intended especially for hotels, restaurants, and soda fountains.

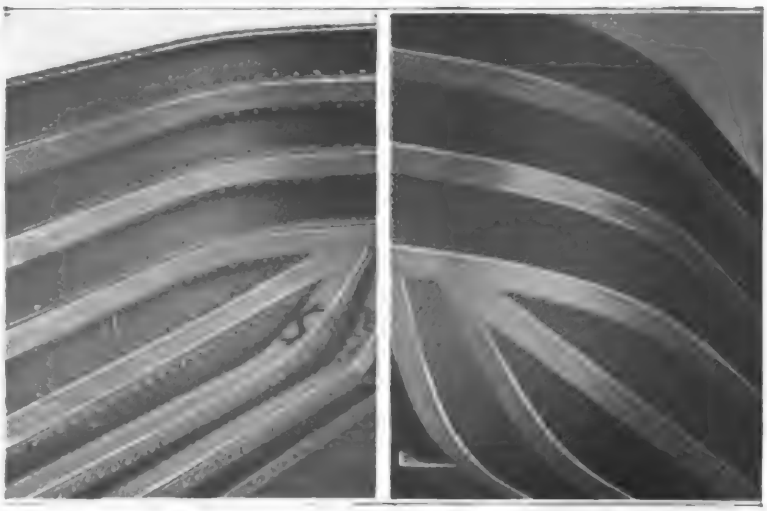
Motor-Driven Fruit-Juice Extractor: The User Presses a Half Orange or Lemon on the Bulb, and the Juice Flows from the Spout. The Machine is Seen Above Disassembled for Cleaning

## COSTLY FOUR-MILE HIGHWAY IN NEW YORK STATE

Mileage considered, a road which is to be constructed between West Point and Newburgh, N. Y., will be one of the most costly highways in the country. Though it is but four miles long, it is estimated that an outlay of $700,000 will be necessary for its completion, or, in other words, $175,000 for each mile. The short road will extend around Storm King Mountain, about 300 ft. from the base of that eminence, and will be in the form of a great shelf hewn in solid rock. Traffic between New York City and Albany, N. Y., will use the stretch.

## WOOD AND STEEL COMBINED IN NEW-TYPE BOAT HULL

Channel steel is combined with wood in a novel manner in the construction of boat hulls built up or assembled according to a recently patented system, which is declared to produce exceptionally strong and durable bottoms at a relatively low cost. The metal is placed in lengthwise strips, with the flanges turned inward, material 12 in. wide being employed. Pine timbers, 6 in. square, are laid between the channels, and 8-in. bolts, passing through these and the flanges at 6-in. intervals, bind the parts together. Before the bolts are tightened, cotton gaskets, saturated with lead paint, are inserted between the wood and metal as calking. Canal barges and harbor lighters constructed in this way are said to have the advantages of both wood and steel boats, and to possess none of the disadvantages of either, being light, resilient, and resistant.



Boat Hull of Channel Steel and Wood: The Illustration on the Left Shows the Interior, and in It can be Seen How the Strips are Fastened Together with Bolts and Calked with Paint-Saturated Cotton Gaskets. At the Right Is an Exterior View

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# SAND FOR LOCOMOTIVES SUPPLIED LIKE WATER

In This Substantial Concrete Building is Housed and Dried All the Sand for the Locomotives of the California State Harbor Board That Operate around San Francisco Bay. Wet Sand is Unloaded from the Cars into the Open Windows

The Wet Sand is Shoveled into the Top of This Drier, and, When Dried by the Central Heater, It is Run Out through the Apertures at the Bottom

Into This Tank the Dried Sand is Shoveled, and Pressure is Then Applied

Just as He Secures Water from the Overhead Tank, the Fireman Is Here Able to Fill His Box with Sand by Means of Compressed Air

Locomotives owned by the California State Harbor Board and operated about San Francisco Bay are all supplied with sand from a central drying house, specially designed and built for the purpose. Wet sand delivered to the "house" is first shoveled into a steel drier, shaped like an inverted cone, where a central heater removes all moisture and permits the dry sand to escape through openings at the bottom. This sand is then shoveled into a large air-tight tank, where it is placed under heavy air pressure. So, when a fireman wishes to replenish the sand box of his locomotive, he has simply to insert into the end of the pipe leading from the tank. A turn on the convenient valve handle, and the sand is pushed up from the tank and into the sand box. With this efficient equipment the operation requires only 10 seconds.

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¶ Canada's magnificent potentialities are demonstrated by the fact that of her 2,300,000,000 acres of land area only 39,000,000 are now under cultivation.

*Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.*

## UNUSUAL FACTORY BUILDING INCLUDES FOUR WINGS

Believing fresh air and sunlight conducive to good workmanship, a manufacturing company in a middle-western city is erecting a plant on lines which will provide employes with these in abundance. Two divergent wings will connect with the main portion of the building at either end, making the ground plan of the structure resemble two immense "Y's," joined at their lower ends. Most of the extensive wall space will be taken up by windows. This type of construction is unusual for factories, though many examples of it are to be seen in apartment buildings, hotels, and hospitals.

**Fresh Air and Sunlight can Enter This Unusual Manufacturing Plant from Many Angles. It is being Erected in a Middle-Western City and will Cost $150,000**

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¶ It is believed that patrons of New York City's Fifth Avenue busses will soon be protected from the rain by removable tops which will cover the upper decks.

## METAL FISH HELPED TRACK GERMAN U-BOATS

The story of the two submarine-hunting sea lions was told in the July issue of this magazine. The venture was remarkable in itself; yet even more so is a mechanical application developed from the experiments and lately revealed at a conference of British scientists. Sea lions were found to have their limitations; the "personal equation" was too prominent. So, hollow bodies, shaped like seals or porpoises, were made of very thin metal and equipped with hydrophones in the center of the heads. Such a metal fish was filled with water and towed by a vessel of the submarine patrol. Inclosed in the towing cable were wires which led to sensitive telephone transmitters on board the vessel. Dragged at the end of a very long towing cable to eliminate local noises, the metal fish often gave warning of enemy submarines at surprising distances.

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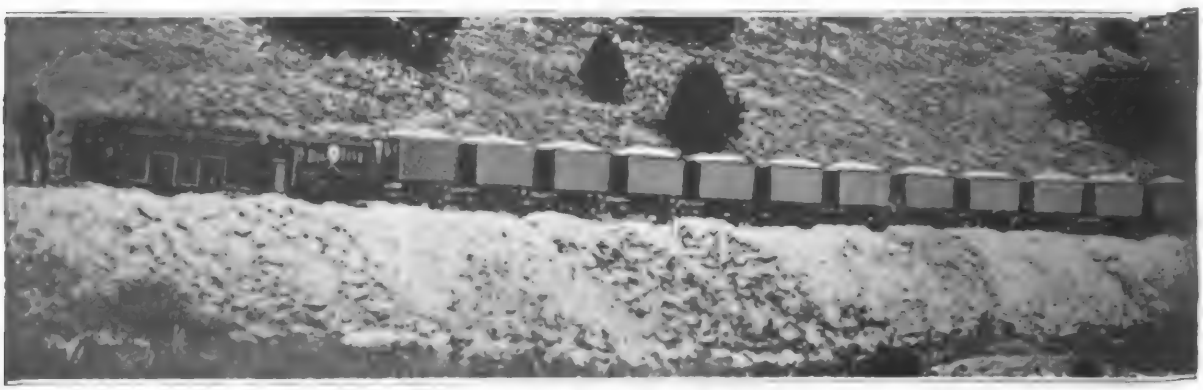
## STORAGE-BATTERY LOCOMOTIVE PULLS FORTY-CAR TRAIN

Mining locomotives usually confine their services to subterranean levels, and seldom appear in public. A certain Colorado metal mine, however, has 1½ miles of its 5½-mile track system above ground, and a little locomotive, less than the height of a man, is commonly seen pulling upward of 30 ore cars with neither



**Mining Locomotive Driven by a Storage Battery of 208 Cells, Hauling an Astonishing Load along the Surface Track Pulled a Total of 40 Ore Cars, Each of 2½ Tons, Negotiating the Low Grades of the Run without Trouble. The Length**

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An Elaborate Illuminating System, Installed during the War, Consisting of Powerful Searchlights and Thousands of Incandescent Lamps, Prevented Enemy Agents from Destroying This Great Irrigation Dam across the Snake River, near Twin Falls, Idaho

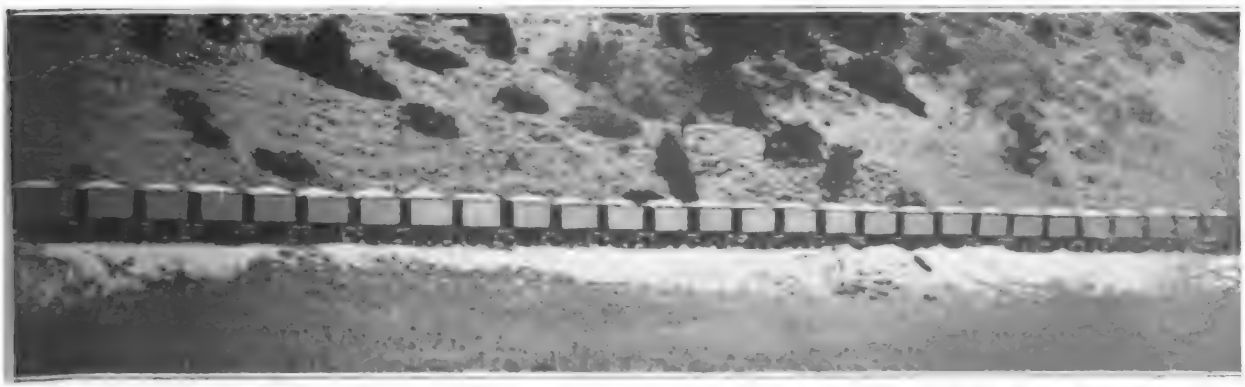
smoke nor trolley. A 208-cell storage battery of the nickel-iron variety, installed in the tender, supplies the power, which is so great that in a recent test the electric engine hauled a 40-car train of 2½-ton cars with ease, even over the light grades of the right of way.

## DIAMOND HUNTERS TO SEARCH RIVER BED IN DIVING BELLS

Forming the bottom of the deep pools along the Vaal River in southern Africa are virgin diamond beds which will shortly be the scene of unusual mining operations. A shallow-draft boat, anchored on the surface of such a pool, will lower to the bottom a diving bell, 15 ft. in diameter, in which will labor several native workers. These will shovel the gravel into the mouth of a compressed-air hoist. By this means it will ascend to the deck, on which will be found the usual equipment of bins, revolving sieves, and sorting tables, in addition to the boilers and engines.

## GUARD BIG IRRIGATION DAM BY ILLUMINATING RIVER

A terrific blow to agricultural interests could be delivered by the destruction of a mammoth dam across Snake River, near Twin Falls, Idaho, as water impounded by the structure irrigates and renders productive a large tract of land in that vicinity. During the war there were rumors that enemy agents were plotting to blow up the obstruction, and these reports so alarmed local residents and authorities that unusual means were taken to protect the dam. A strong guard was maintained on the site at all times, while powerful searchlights were installed along the river to illuminate the stream at night. The dam itself was lighted by thousands of electric bulbs, many of them colored. Written permission was necessary before the structure could be crossed. Since the signing of the armistice, the guard has been withdrawn, but the illuminating system is still in service. The dam is a gorgeous sight when this is in operation.



of a Western Metal Mine: The Locomotive's Height Is Less Than That of a Man, Yet in the Test Pictured Here It of Track above Ground, on Which Such Hauling is Done, Is 1½ Miles, There Being Four Miles Underground

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# CONCRETE CANAL ENLARGED BY CURIOUS METHOD

The Cars of Material, Mule-Drawn, were Hauled down the Center of the Canal Itself

The Cars were First Hauled up the Mountain Side by Cables

Above, Forms in Place for the Concrete Additions to the Canal. At Right, Workmen Using Boards Laid on the Cross Braces as a Platform While Building Up the Canal's Height

The Yakima-Tieton irrigation canal, in the state of Washington, has recently had its capacity increased from 300 cu. ft. per second to 350. The canal, really an aqueduct of reinforced concrete, is practically all above ground and of slightly more than half-circular section, 8 ft. 3⅝ in. in diameter. It was enlarged by building its sides one foot higher with concrete, braced across the top with channel irons, 5 ft. apart. Grooves were cut along the top of the old concrete to key the new. Materials were hauled in 15 miles by motor truck; but a considerable length of the canal is inaccessible by road, and runs at the foot of a sheer cliff. Along this portion the material was hauled in, small cars running on the concrete bottom of the canal itself, drawn by mules, after the original concrete cross braces had been removed. By this expedient, the work of raising the walls was carried on without interruption.

## SEARCH FOR INFLUENZA GERM CONDUCTED BY SCIENTISTS

Until the germ which causes influenza has been discovered, no reliable vaccine for the prevention of the disease can be produced. For that reason four of the most prominent scientists in the country are working together in a systematic search for the elusive bacillus. Serums now employed contain pneumonia germs and other bacilli, but the results obtained from their use show them to be of uncertain value. Influenza itself is declared by medical authorities to be fatal only in rare instances, but dangerous in that it prepares the way for attacks of pneumonia, which causes many deaths. An effective serum will do much to prevent the recurrence of epidemics like that of last year.

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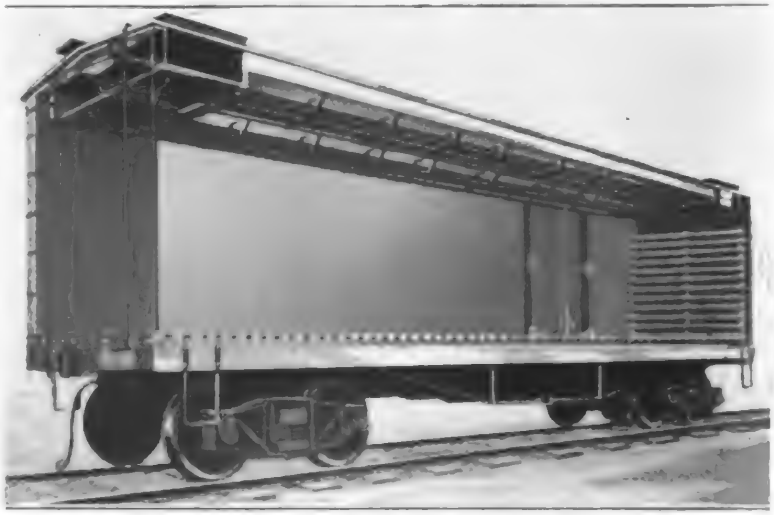
## SWAYING MOTION OF TRAINS CIRCULATES COLD BRINE

The swaying motion of moving railroad trains is utilized for circulating chilled brine through the pipes of a new installation for refrigerator cars that is said to maintain a more even temperature than is possible with any present system. Two overhead tanks are placed at either end of a car, and connected by a number of pipes, hung a few inches below the ceiling. Each tank is divided by a partition paralleling the ridge of the roof, and in each partition are four automatic check valves, opening to the right in one tank, and to the left in the other. Ice and salt are placed in the tanks, and the weight of the resultant brine opens and closes the sets of valves alternately, depending on the direction of the car's sway. The installation can be used for heating by shutting off the overhead pipes, injecting steam into the tanks, and circulating the brine thus heated through two pipes connected to the tanks and laid on the floor. Low cost of operation is one of the advantages claimed for the device.



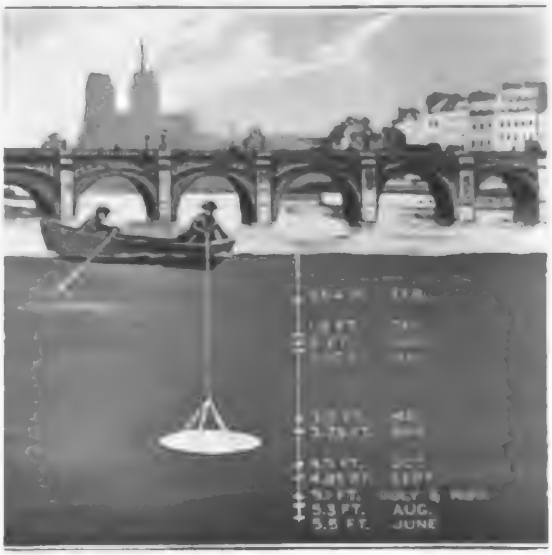
**Automatic Cooling System Installed in a Refrigerator Car: This View Shows the Arrangement of the Brine Tanks and the Overhead Pipes in Which the Cold Fluid Circulates**

## AMERICAN SALESMEN IN FRANCE NEED BUSINESS CREDENTIALS

Every American commercial traveler in France is compelled by a recent law to secure from his firm a card of identification which must be visèd by the nearest chamber of commerce in the United States. All foreigners in France are affected alike by the law, as well as by the penalty for disobedience.

## TEST WATER IN RIVER SEINE FOR TRANSPARENCY

Tests made to determine the transparency of the water in the River Seine in Paris have resulted in the discovery that this varies considerably for different months of the year. The apparatus used in the tests consists of a sheet-metal disk, painted white, and slung at the end of a small rope. The disk is lowered into the stream from a boat until it becomes invisible to the observers. A mark is made on the rope at the surface of the water, and thus the depth at which the disk vanishes is learned. Generally speaking, the water is more transparent in warm weather than in cold. The disk disappeared at 6¾ in. beneath the surface in February, but could be seen at 5½ ft. in June.




BY COURTESY OF LA SCIENCE ET LA VIE

**Device for Testing the Transparency of the River Seine: The Scale Shows How This Varies for Different Months of the Year**

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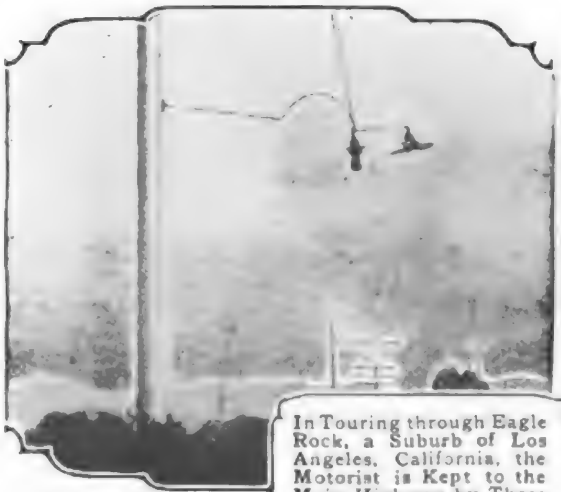
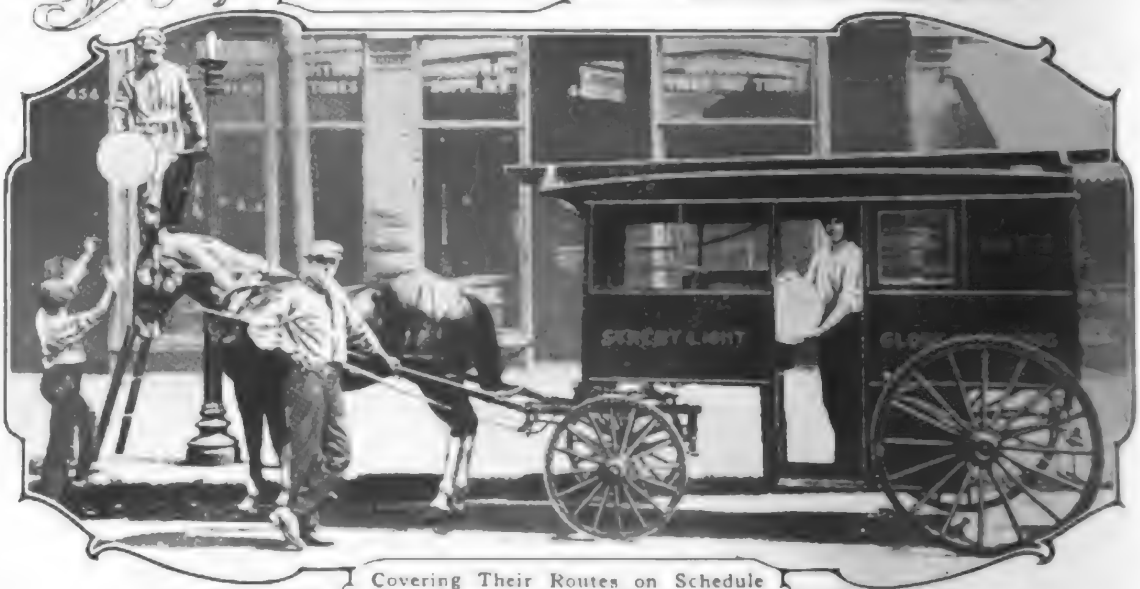
# CIVIC FEATURES THAT PROMOTE THE COMFORT



In Touring through Eagle Rock, a Suburb of Los Angeles, California, the Motorist is Kept to the Main Highway by These Red Lights, Placed One at Every Turn

Determined to Prevent a Repetition of a Grade-Crossing Disaster That Cost a Life, the Citizens of Topsham, Maine, have Posted near the Tracks This Arresting Sign



Covering Their Routes on Schedule Time, Cleaning Crews Like the Above Keep the Street Lamps of Indianapolis, Indiana, Bright and Clean. The Wagons Carry Boiling Water, Cloths, and Extra Parts

The "Safety Zones" on the Business Streets of Chattanooga, Tennessee, are Marked by Elevated Concrete Platforms, Instead of the Posts and Chains Employed in Many Cities



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## AND ENJOYMENT OF VISITORS AND RESIDENTS

The Poor of Harrisburg, Pennsylvania, are Carried Free in This "Carryall" to Near-By Woods and Parks. The Car has Traveled 15,000 Miles on Its Errands of Mercy

These Concrete Tables and Benches have been Built in a Picturesque Cañon by the People of San Bernardino, California, as a Convenience to Picnickers and Motor Tourists

This Wrecking Truck Is Part of the Equipment of the Boston Fire Department. It Weighs Seven Tons and is Used to Pull Down Walls at Fires, to Tow In Wrecked Apparatus, and for a Dozen Other Purposes



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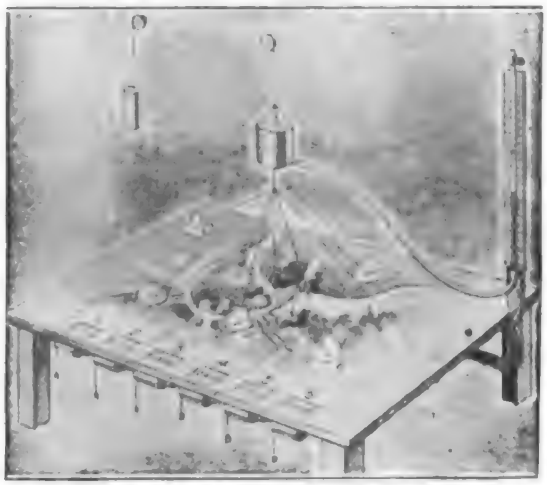
## ANTI-AIRCRAFT FIRE CONTROL SIMPLIFIED BY CALCULATOR

The army officer assigned to the anti-aircraft artillery has hitherto been regarded by his comrades of the line as a



As the Can is Moved over the Terrain Board to Simulate the Flight of a Hostile Airplane, the Drums Corresponding to the Anti-Aircraft Batteries Register the Ranges. The Water Gauge Registers Altitude

mathematical prodigy, with head full of figures, formulas, and mystic symbols. Now appears a mechanical apparatus prepared to do most of his calculating for him. Over a terrain board representing the battle area hangs an object which is moved in exact correspondence with the flight of the hostile air craft. From this object cords stretch down to positions of friendly batteries and searchlights. Here the cords wind on registering drums to show the range in yards from each station to the target. Similarly, at each gun or searchlight station is a vertical quadrant, free to revolve over a horizontal, graduated circle, making it easy to read at a glance the angles of elevation and deflection for each station.

## FIRST FREE BALLOON FLOATS OVER NEW YORK CITY

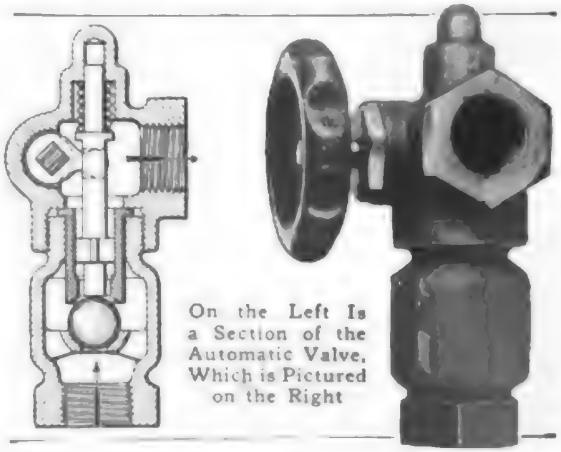
The people of New York City recently witnessed for the first time the passage over their busy streets of a free balloon. The bag was of the largest type used in the navy, holding 35,000 cu. ft. of hydrogen gas. In the basket, 1,500 ft. above the crowds, rode four naval officers who threw overboard thousands of enlistment circulars when not busy with the management of their craft. After drifting for six hours, a rainstorm drove them to earth in New Jersey.

## WAR VETERAN ASPHYXIATED IN TEST OF GAS MASK

The tragic asphyxiation of an American veteran of the great war lends force to the warnings published several times by this magazine. The army gas mask is not intended for promiscuous use; it is designed solely for protection against the few gases used in warfare. This veteran attempted to test his mask by putting it on, and then opening three gas jets in the kitchen of his home. His mother returned half an hour later, to be guided by the smell of gas to the kitchen, where she found her son a crumpled heap upon the floor, stone-dead.

## AUTOMATIC VALVE CLOSES WHEN PIPE BURSTS

A valve that closes automatically to stop the flow of liquid, steam, or gas in a broken pipe has been placed on the market. The device is constructed so that sudden reduction of the pressure on the outlet side, which would ensue if a pipe burst, causes the pressure on the inlet side to push a ball into a seat, thus closing the valve. Under normal conditions, the ball is held away from the seat by a spring. To reopen the valve after it has closed itself, it is necessary to employ a handwheel provided for that purpose. The manufacturers recommend the device for use in pipes supplying oil



On the Left Is a Section of the Automatic Valve, Which is Pictured on the Right

to large burners, where an explosion might result from the continued flow of fuel from a ruptured pipe.

¶Aerial mail service for Brazil will be inaugurated as soon as an expected appropriation for that purpose has been made by the proper authority.

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**Locomotive Driven by Air Screws, Which are Mounted on the Shafts of Vertical Engines at Front and Rear of the Coach: The Big Truck Weighs 14 Tons, Carries 40 Passengers, and Runs at High Speeds**

## AIR-PROPELLED LOCOMOTIVE IS EUROPEAN NOVELTY

The rapid development of the air screw and of the power for driving it, and its remarkable efficiency, are encouraging its use even in applications where a more substantial traction is available. Many boats have adopted it as a successful substitute for the underwater propeller, and motor trucks have been experimentally driven at high rates of speed. Now a European builder has incorporated the air-drive principle into a 14-ton 40-passenger locomotive. The two vertical engines are mounted outside the body of the coach, front and rear, with a powerful air screw on the shaft of each, and the big truck runs at express-train speed.

## COST OF STREET-CAR RIDES VARIES WITH LENGTH

Fares vary according to the distance individuals are carried on the street cars in Newark, N. J., where a novel system of collecting has been inaugurated. The city is divided into zones, and when a passenger boards a car he is given a check that indicates in which one of these he started to ride. As he leaves the car he presents this check to a conductor, who computes the fare to be paid on the basis of three cents for the first zone traversed, and two cents for each additional zone. Passengers enter at the front of the cars and alight at the rear.

## COBBLESTONES USED AS BASE FOR ASPHALT PAVEMENT

After serving for years as pavement on one of the principal business streets of Cleveland, Ohio, old-fashioned cobblestones were taken up recently, and now form the base of a modern asphalt thoroughfare in the same location. The stone blocks had been laid on edge in sandy soil, so their removal was an easy task. After they had been cleaned and a few inches taken off their former foundation, the stones were relaid, this time on their sides. On top of them was placed a 2-in. layer of crushed rock, bound together with tar, and over this was spread the surface layer of asphalt, 1 in. thick. The

**At the Top Is a Section of the Old Pavement. How the Cobblestones were Used in the New Street Covering is Pictured Below**

utilization of the cobblestones reduced the cost of the new pavement by making unnecessary the purchase of much new material.

***Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.***

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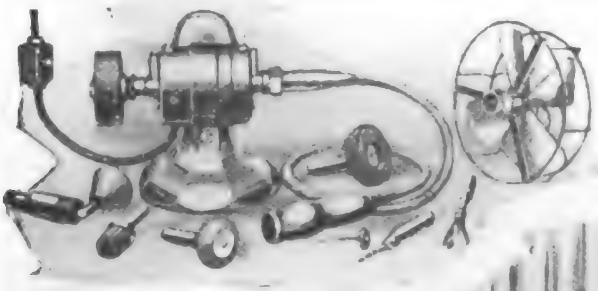
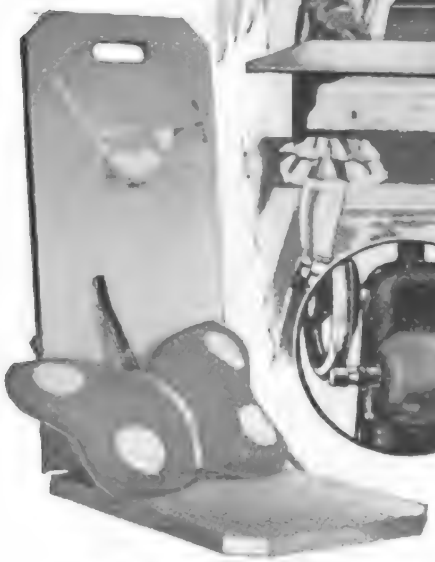
# SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



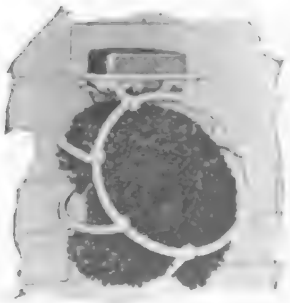
Among the Set of Attachments for This Little Electric Motor Are a Flexible Power Shaft, an Egg Beater, a Fan, and a Drill

Made of White Porcelain, a New Lighting Fixture Serves Admirably All Night in the Bedroom of an Infant, or in the Hall, as It Contains Only One Small Electric Bulb, Shaded to Produce a Subdued Glow

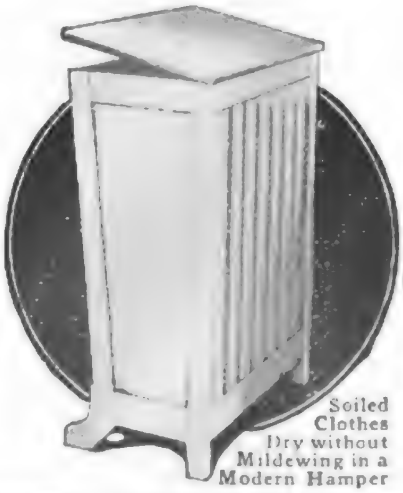


Beach Chair with Pneumatic Cushion: When the Air is Released from the Latter, the Back and Seat can be Folded for Carrying

When Closed, This Electrically Driven Sewing Machine Resembles a Writing Desk, as Shown at the Right. The Motor is Permanently Attached, as Shown in the Circle. Its Speed is Controlled by a Switch Designed to be Operated by Pressing with the Knee



Attached to the Wall beside a Tub, This Simple Device Holds a Sponge and a Cake of Soap within Easy Reach of a Bather



Soiled Clothes Dry without Mildewing in a Modern Hamper

A Sole Tip of Rubber, Studded with Small Knobs of Leather, is Intended to Prevent the Foot Throttle of an Automobile from Wearing Out the Shoes of a Driver Who Spends Much Time at the Wheel



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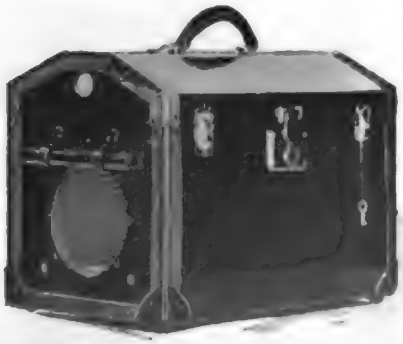

More Like a Traveling Bag Than a Kennel in Appearance, This Ventilated Fiber Case can be Carried on a Train or Street Car with a Small Dog or a Cat Comfortably Hidden Inside. A Patent-Leather Curtain can be Rolled over the Larger Air Hole and Fastened in Place with Snaps

An Artistic Shade for the Nursery Lamp: The Cunning Silhouette is Placed between Two Pieces of Transparent Silk

A Compact, Inconspicuous Anti-Influenza Nose and Throat Sprayer That can be Carried in a Woman's Pocketbook

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Embroidering Is Neither Tiresome nor Slow with This Machine, Which will Finish in an Hour a Piece of Fancy Work That would Require Two Weeks to Complete with a Needle. It is Operated by Manipulating the Center Rod, and Obtains Its Supply of Thread from the Two Spools

Designed for Persons Who have Lost an Arm, the Combination Knife and Fork can be Converted from One to the Other by Changing the Position of the Semicircular Blade

A Replaceable Paper Tape, Coated with Material on Which to Strike Safety Matches, is Wound on a Reel in the Center of This New Ash Tray

The Conveniences of a Flat-Top Desk and Those of a Bookcase are Combined in This Piece of Furniture, Which Is as Useful as It Is Ornamental



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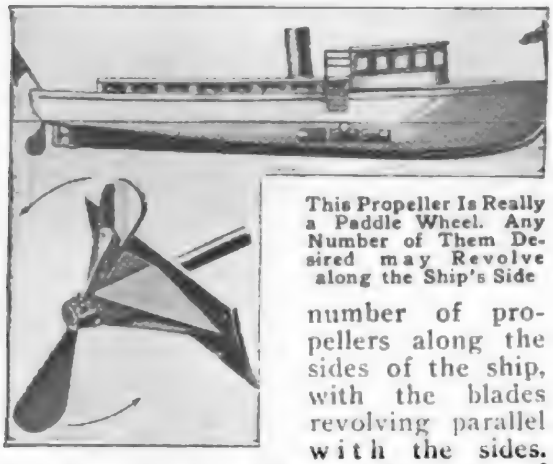
## MARINE PROPELLER REVOLVES PARALLEL WITH SHIP'S SIDE

Ship's propellers have been placed at the stern since the days of John Ericsson; yet an inventor now proposes to range any

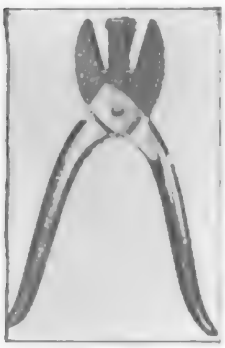


This Propeller Is Really a Paddle Wheel. Any Number of Them Desired may Revolve along the Ship's Side

number of propellers along the sides of the ship, with the blades revolving parallel with the sides. His propeller is really a paddle wheel, of course, rotating below the water line. Through a hole in the end of each transverse driving shaft extends a movable rod bearing the two propeller blades, which are fixed at right angles to each other. As each blade finishes its power stroke a cam wheel on the rod engages with a slot on the main-shaft bearing, turning the blade through a right angle so that it makes the upper part of each cycle on edge, offering no resistance to the progress of the ship. Besides an increase in speed, the inventor believes that these propellers will effect a decided gain in maneuvering ability.

## PAPER RIVETER AND PUNCH LIKE TWO-JAWED PLIERS

Two useful office devices are combined in one simple tool by the manufacturers of a patented paper riveter and punch, which resembles a pair of pliers with double jaws. One of the jaws is designed to fasten together sheets of paper with tubular rivets of soft metal, while the other comprises a perforator for making circular holes in the same material. The jaw used as a riveter can also be employed for removing clinched rivets.



## OVER-SEA DEAD CANNOT BE CARRIED TO AMERICA

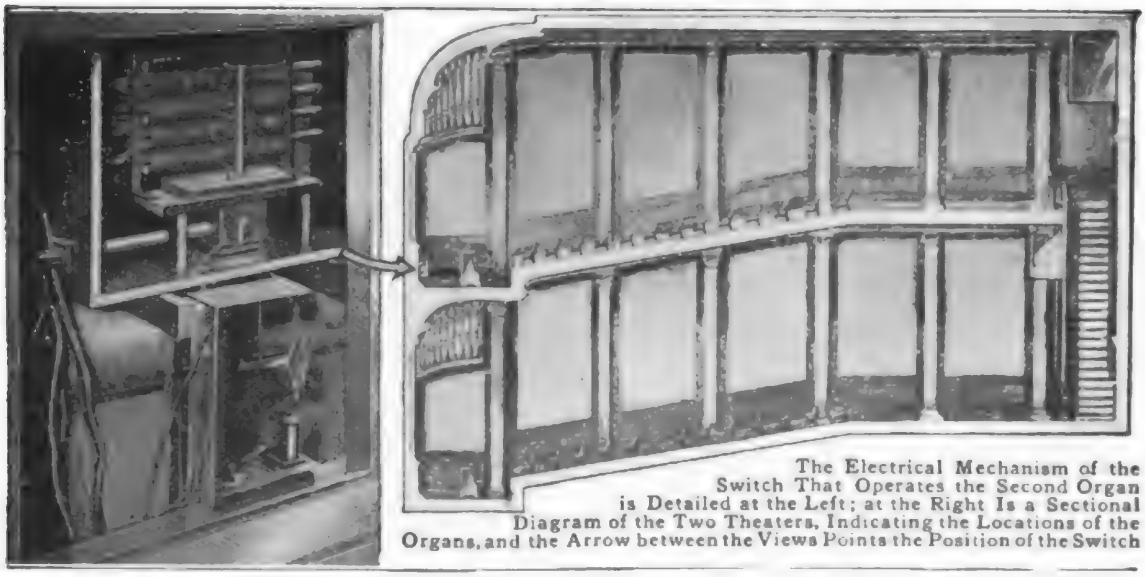
Lack of railroad transportation is the reason given for the French refusal to permit the exhuming of America's soldier-dead and their return to their native soil. Not for three years will the ban be lifted. This unexpected decree of the French president has brought the keenest disappointment to many American parents, who have reached Paris only to learn that their mission of love is in vain. It is also unfortunate that no bodies can be brought into France from Luxemburg or Germany.

## ODD USE OF GRAVITY MADE IN NEW REMINDER CLOCK

Reminder clocks have long proved themselves useful to business and professional men, and are even valued by many housewives. Different from any yet produced, however, is a new clock in which gravity is put to a novel use. At the base of the case is a metal cup in which are many polished steel balls. Around the dial are 48 holes, one for each quarter hour. Behind the holes a slotted disk turns with the hour hand. So when the appointments for the next 12 hours are made the owner of the clock places a steel ball in each appropriate hole. At each appointed minute the slot in the hidden disk tallies with the proper hole, permitting a ball to roll to the base of the clock. Here it makes an electric contact and rings a bell or buzzer, until a touch on a button releases it and allows it to fall back into the cup.

## ORGANS OF TWO MOVIE HOUSES PLAYED BY ONE ORGANIST

The peculiar construction of a pair of picture theaters in Cleveland suggested an ingenious arrangement, just completed, whereby one organist can play simultaneously the organs of both houses. The two theaters are built one above the other, opening on two streets at different levels. Each has its own pipe organ, ordinarily played independently to suit the

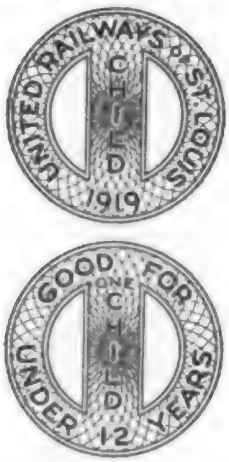


The Electrical Mechanism of the Switch That Operates the Second Organ is Detailed at the Left; at the Right Is a Sectional Diagram of the Two Theaters, Indicating the Locations of the Organs, and the Arrow between the Views Points the Position of the Switch

pictures on its own screen. By making an electric switch with as many contacts as the organs have pipes, and connecting the electrically played instruments to the switch, both sets of pipes are made to play in unison when either keyboard is operated. The contact switch, and also a master switch are controlled by solenoids connected to push buttons on the organs. The two organists, working in shifts, use a buzzer system for signaling when they take their rest periods, at which time the switch is thrown and the instruments play together.

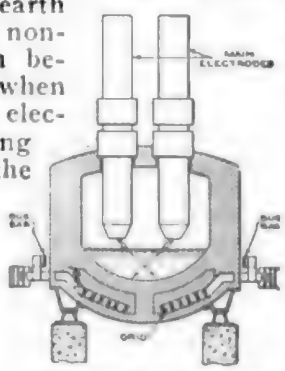
## USE METAL CAR-FARE TOKENS ON STREET RAILWAYS

Metal tokens issued by a street-railway company operating in St. Louis are accepted on city cars in lieu of odd-cent fares, thus simplifying the work of conductors and obviating the necessity for a large supply of pennies. Those used by children are of bronze, about the size and shape of a nickel, and are sold at a reduced price when purchased in quantities. They are equivalent in value to four cents. Tokens for adults are sold at slightly under eight cents each when a number are bought at one time.




## HEARTH FORMS ONE ELECTRODE OF NEW ELECTRIC FURNACE

An improved form of electric-arc furnace, recently designed in England, uses as one electrode a hearth of material, normally non-conducting, which becomes a conductor when heated. The main electrodes, corresponding in number to the single, two, or three-phase current supplied, and one auxiliary electrode, enter the top of the furnace. To start with a cold charge, the auxiliary electrode is lowered into contact with the metal, and an arc drawn between the surface and the main electrodes. By the time the metal begins to melt, the hearth has heated and become a conductor, and the auxiliary electrode is withdrawn. The hearth of the two-phase furnace, which is the one shown in the sketch, has two conductor grids, so arranged and connected that the currents from the two main electrodes cross each other in the metal, assuring a thoroughly mixed charge.




¶One of the many species of American holly, the one known scientifically as "Ilex vomitoria," has been found by chemists to contain large amounts of the drug caffeine, one to one and a half per cent being available from the dried leaves.

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## PREPARATION OF HEAVY FUEL FOR TRUCKS AND TRACTORS

For the use of heavy fuels, such as kerosene, alcohol, distillates, and low-grade gasoline in trucks and tractors, a

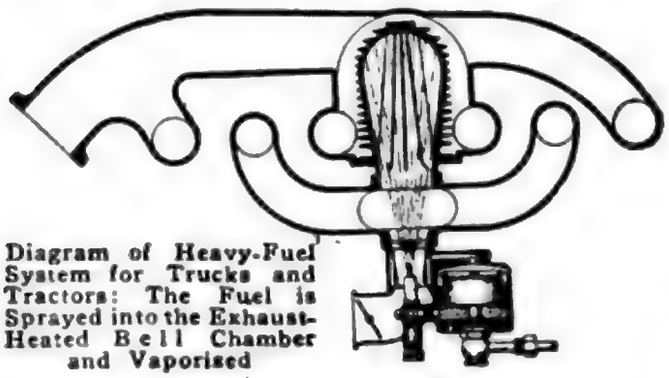
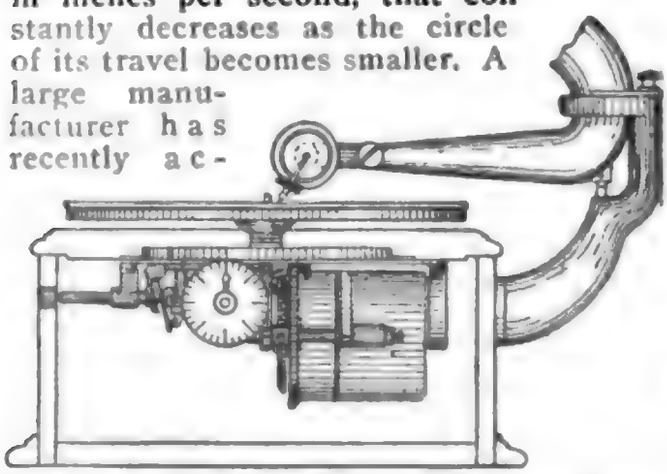


Diagram of Heavy-Fuel System for Trucks and Tractors: The Fuel is Sprayed into the Exhaust-Heated Bell Chamber and Vaporised

new system of preparation is announced. The spraying nozzle of the carburetor divides the fuel into extremely fine particles. These are thrown forward with high velocity into a bell chamber heated by the exhaust gas, while the air, lacking the inertia of the fuel particles, does not enter. The pressure being at a minimum, the fuel is instantly vaporized, and then passes into the mixture. The relations of heat and pressure are carefully studied in the device, and a constant temperature is maintained in the mixture at all speeds.

## RECORDS IN NEW PHONOGRAPH MOVE AT CONSTANT SPEED

In an ordinary disk phonograph, the record moves under the needle at a rate, in inches per second, that constantly decreases as the circle of its travel becomes smaller. A large manufacturer has recently ac-

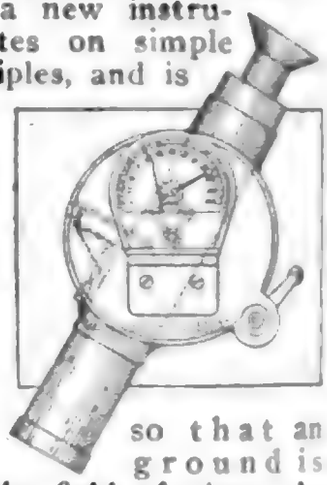


At the Left of the Speed-Indicating Dial, Seen in the Center, Is the Cam Mechanism for Adjusting the Linear Speed of the Record

quired an invention which increases the rotational speed of the disk as the needle approaches the center, in exact proportion to the decrease in groove diameter. This is accomplished by means of a slowly moving cam, which gradually changes the position of the friction plate on the governor, allowing the motor to run faster and faster. The same process must, of course, be used in the manufacture of records for use with the machine, the result being a uniform range of vibration values intended to improve the reproducing effect. The cam may be manually thrown out of action for the use of ordinary records, the machine then running at uniform speed as in present practice.

## INDICATOR SHOWS AIRPLANE GROUND SPEED DIRECTLY

If the hopes of the inventor are justified, the equipment of the aerial navigator will soon include a new instrument which operates on simple trigonometric principles, and is intended to indicate the speed of the air craft relative to the earth. A telescope, or sighting tube, pivotally mounted on the framework of the cockpit, is moved by means of a hand crank so that an object on the ground is kept constantly in the field of view. As the crank is turned, a pointer moves slowly across a dial graduated in miles per hour. Secured to one side of the telescope, its face perpendicular to the line of vision, is a stop watch with an elongated second hand that swings into the tube of the telescope and becomes visible to the observer only at the bottom of its revolution. The navigator continues to turn the crank, keeping the ground point always in view, until the hand of the stop watch swings into his line of vision. At that instant he arrests the crank and reads from the indicator dial the true speed of his craft in miles per hour.



## MEN'S TAILORS WOULD REVIVE STOCKS AND KNEE BREECHES

Strolling along the astounded streets, displaying themselves to public and social gatherings, 1,000 young dandies are expected soon to demonstrate to the people of London a reactionary change in fashions sponsored by a group of local tailors. Perhaps the tailors will not be able to find so many men of iron nerve. It is a fact, nevertheless, that they hope to revive in part the fashions of the

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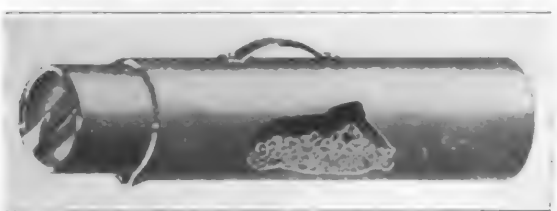
18th century. They would dress the smart English business man in plum-colored lounge coat and knee breeches, a white stock is to show above his yellow waistcoat, his shapely calves are to reveal themselves in black hose, while silver buckles will adorn his shoes.

## WORTHLESS DESERT SHRUB YIELDS NEW ALKALOID

Two years before the war, as the story is told, two German chemists applied for permission to experiment with the plant life on a great semiarid ranch in central Mexico. Their request was granted, with the understanding that they furnish a complete report of their findings. The two chemists worked feverishly, and chiefly on a squat, odorous shrub called "gobernadora," long reputed to possess medicinal properties. Suddenly they disappeared; what they had discovered was never known. Now, after experiments with this same desert shrub which they have found in the drier parts of New Mexico, chemists of the U. S. Department of Agriculture believe that they have discovered another alkaloid to add to the list which already includes morphine, quinine, and cocaine. Its chemical and pharmaceutical properties are now under investigation.

## TELESCOPIC METAL CARRIER FOR AUTO-TIRE CHAINS

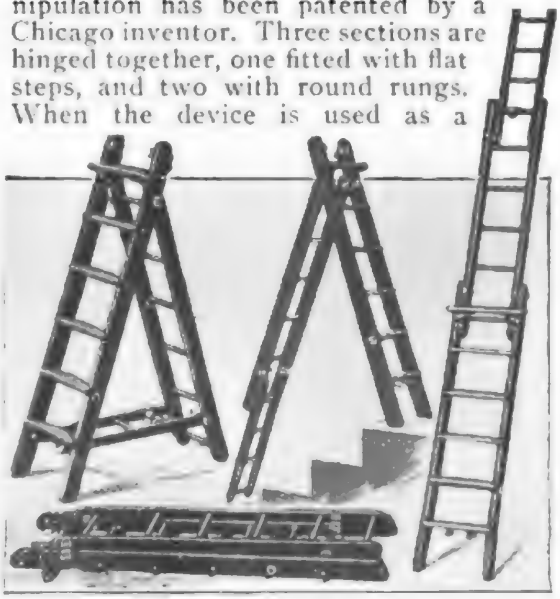
Mud-covered automobile-tire chains are prevented from soiling a car when stowed in a new case, for which a patent has been asked. The container consists of two sheet-metal cylinders, open at one end, which telescope together and are held in position by springs protruding through slots in the smaller member. Liquids can be carried in the disjointed sections. To facilitate pouring, the larger section has a lip on its open end, and a handle on its curved surface. Besides, handles are provided at the closed ends of both cylinders.



**If Placed in This Telescopic Metal Case, the Parts of Which can be Used as Buckets, Mud-Covered Tire Chains cannot Soil a Motor Car**

## SECTIONAL LADDER CAPABLE OF EASY TRANSFORMATION

A stepladder which can be converted into an extension ladder by simple manipulation has been patented by a Chicago inventor. Three sections are hinged together, one fitted with flat steps, and two with round rungs. When the device is used as a stepladder, the intermediate portion serves as a prop for the step-equipped, or bottom, section, while the top section is attached to the underside of the lower step and acts as a brace. By alining the three sections, a ladder of considerable length is obtained. If a shorter ladder is desired, the two lower sections can be used. To use the ladder on a stairway, the lower section is placed with its free end on a step, and serves as a prop for the other two. Locks are provided at the joints for holding the parts in position after they are alined.



**Three Ways of Using the Combination Ladder are Illustrated. Below, the Device is Shown with Its Sections Folded**

## SOFT OPTICAL GLASS EASILY DENTED OR CORRODED

Most persons think of glass in terms of bottles or window panes, and are not aware that some forms of optical glass are extremely soft, and scratch very easily. The sensitive surface may even be dented, and a drop of water left to evaporate is likely to cause a permanently corroded spot, for which there is no possible remedy. A film of moisture acts the same way, removing the delicate polish and pitting the surface until the colors of interference, or a yellow stain, spoils its usefulness. Fine lenses should always be covered when not in use.

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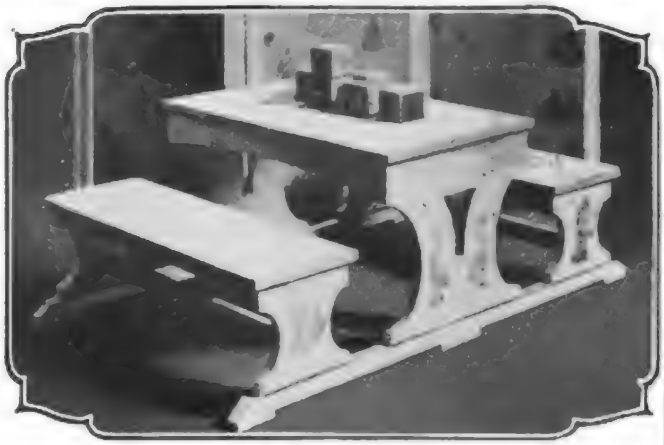
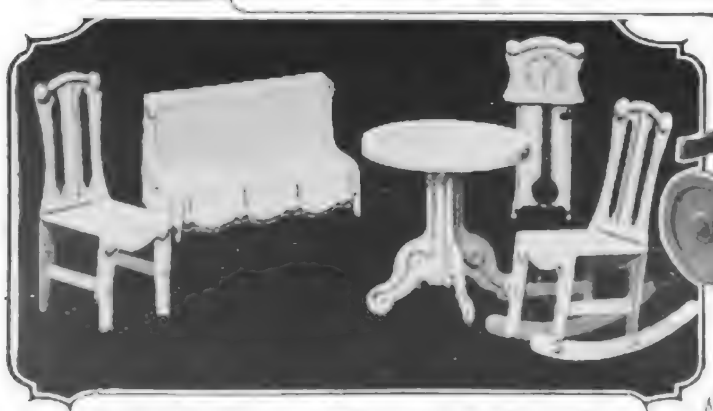


With This Permanent Combination of Nursery Table and Benches Baby Finds It Is Very Convenient to Entertain a Visiting Friend with a "Quiet Little Game" of Blocks

The Blackboard Concealed in the Tray of This Enameled Nursery Table Swings into Place as the Top is Lifted. The Alphabet at the Top Challenges the Child's Skill

The Pleasure Car at the Right Becomes the Business Car at the Left by Adding the Wheelbarrow Body. Clamps Hold the Body in Place While a Hook Locks the Steering Column



Moving Day Recurs So Frequently in Every Doll House That Furniture Breakage Is Considerable. This Parlor Set will Last Longer Than the House. However, as Every Piece is Made of Steel. The Furniture may be Had in Blue, Pink, or White Enamel

This "Pushmobile" for the Little Fellow Steers with a Wheel. Ropes from the Axle Wind around a Drum at the Base of the Steering Column



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Even More Fascinating Than the Movable Scenery in This Little Cardboard Theater Are the "Characters" Who Move About as the Magnet beneath the Stage Pulls at Their Metal Bases

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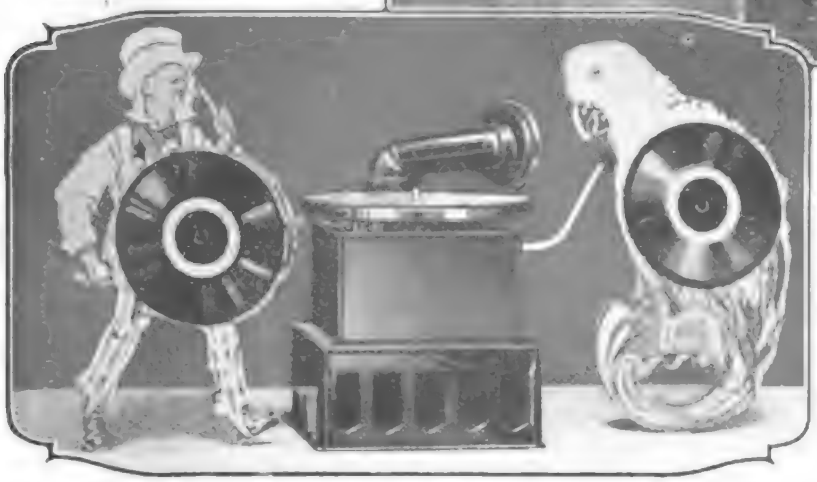
With One Hand in the Culprit's Hair, the Other Is Free to Wield the Electric Spanker. Most American Boys and Girls will Consider This Machine a Joke

Bobbing Down and Back, the Little Figures Carefully Pick Their Way down the Staircase. They are Given the Peculiar Motion by Their Triangular Mountings Which Are Longer Than Each Step, and So Tilt Forward and Slide from One Tread to Another



The Miniature Phonograph in the Center is Built Sturdily to Withstand the Loving Assaults of the Youngsters. The Cardboard Figures at Right and Left Bear Little Records Which Yield Appropriate Music. Uncle Sam Plays a Patriotic March, While the Parrot Imitates the Birds of the Forest



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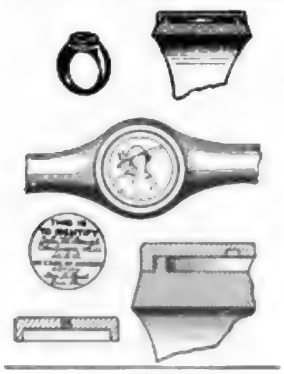
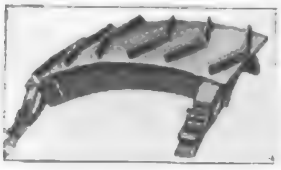
## REMOVABLE SIGNET CONCEALS IDENTIFICATION DISK

Though conventional in appearance, a new finger ring ingeniously conceals certain means for identifying its owner. This is made possible by a removable signet, designed to be screwed to the band over a circular recess, which is converted in this way into a water-tight compartment for holding a disk of metal or paper bearing the name and description of the person to whom the jewelry belongs.



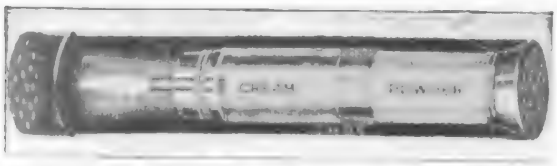
## CLEATED PLATES HELP CARS IN MUD AND SAND

To assist in the extrication of automobiles from mud holes and deep sand, novel attachments for the rear wheels of cars have been placed on the market by a Wisconsin inventor-manufacturer. These are metal plates, resembling sections of cleated tractor-wheel rims, shaped to fit over casing treads. Straps fasten the plates to the tires. A wide, nonslipping surface is thus provided, which enables a machine to run over difficult spots under its own power. One plate is intended to be applied to each rear wheel.



## SHAVING ARTICLES COMBINED IN SMALL ALUMINUM CASE

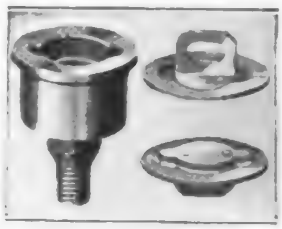
Three shaving conveniences are compactly arranged in a small cylindrical aluminum case which recently appeared on the market. A talcum-powder can, fitted with a perforated cover, telescopes into a tubular receptacle which serves as a brush handle and as a container for shaving cream. Pushing the can into the handle forces cream through a tube into the bristles. Holes in the cap which fits over one end of the case admit air for drying the brush.



Combination Shaving Brush, Cream Container, and Talcum-Powder Can: The Conveniences are Packed in a Ventilated Aluminum Case

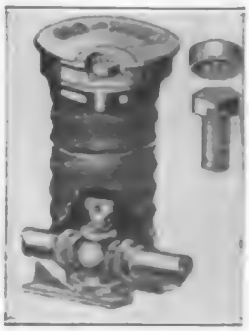
## NEW AUTOMOBILE GREASE CUP HAS HANDLE ON COVER

An automobile grease cup which can be filled and manipulated without soiling the hands, according to its inventor, has appeared on the market. It is equipped with a quick-detachable cover which can be removed by turning a small projection, or handle, designed to be grasped by the thumb and forefinger, or locked in the same manner. When the cover is locked, the cap into which it fits can be screwed down to force lubricant from the cup into a bearing by turning the handle in the proper direction.



## VALVE-BOX COVERS SEALED WITH CAST-IRON CAP

A contrivance intended to prevent the unauthorized removal of covers from tubular water and gas-valve boxes, commonly buried in the ground outside residences, has been patented by an Ohioan. It is a circular cap, or seal, of cast iron, designed to fit over the head of the brass bolt which fastens the cover, and to lock in that position so that it cannot be removed until it is broken. With the seal in place, it is impossible to turn the bolt. A small spring, set in a hole in the head of the bolt, and a pin of special shape inside the cap constitute the locking device.



¶The old War College at Washington, D. C., has been reorganized and rechristened the "General Staff College of the United States Army."

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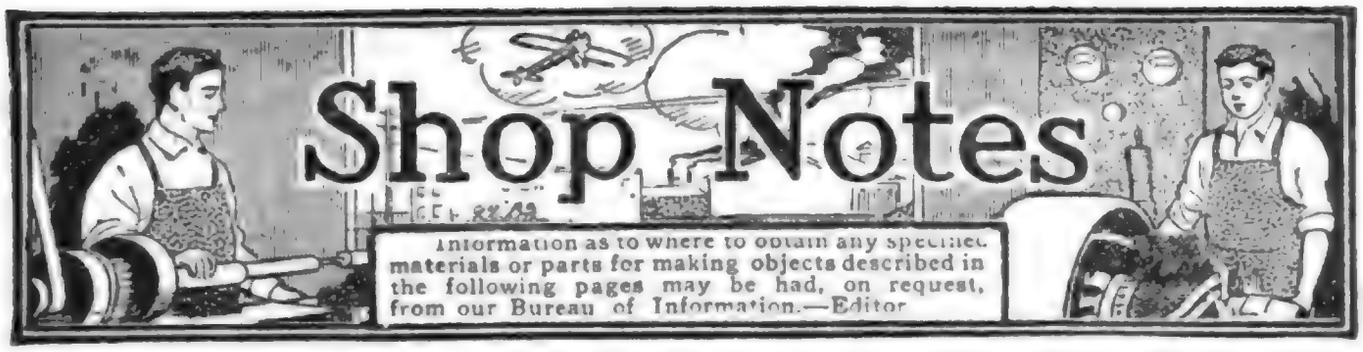
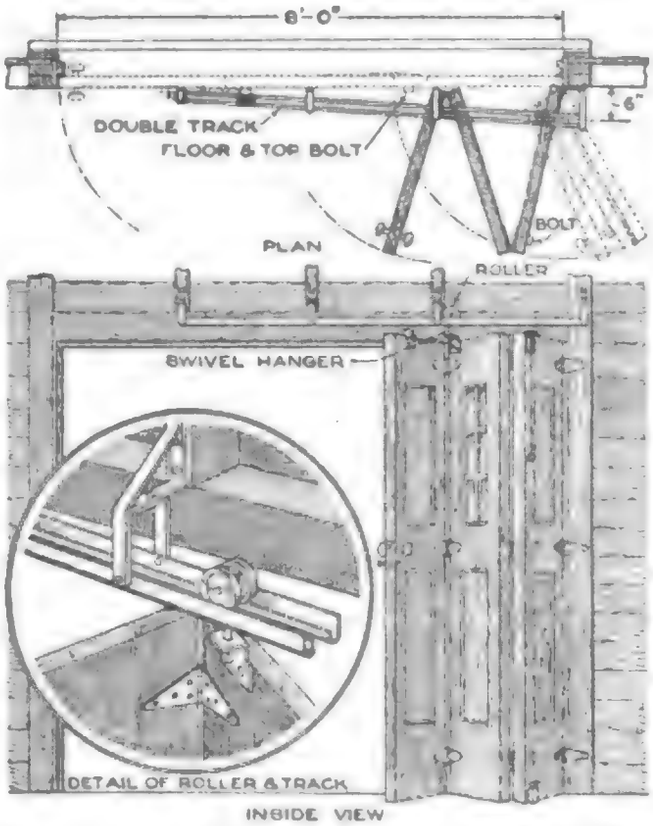



# Folding Doors for the Garage

By P. P. AVERY

ALL of the common types of garage doors have their advantages and disadvantages. Large doors opening outward will warp, and always require a clear space for swinging, the wind blows them about, and wears out the fastenings. Sliding doors, if placed inside, need a long space on one side; or if two doors are used, it takes double labor to operate them. Sliding doors placed outside are perhaps the most satisfactory of the common types, as they are subject only to warping and other effects of the weather.




**The Use of a Swivel Hanger for the Roller Working on the Track Makes Possible a Garage Door of Extraordinary Convenience**

The door illustrated is intended to overcome all these objections. It can be readily constructed without any special manufactured fittings, and can be made as secure against burglary as any of the types mentioned above. The only space required is within a radius of about 3 ft. from the hinged side, and within 3 ft. inside from the door casing. If the car cannot be moved more than 3 ft. inside from the door, there may be difficulty in installing such a door, and this condition must be carefully investigated before deciding on it. The required amount of space should be available in a well-designed garage, in order to facilitate handling the car.

The door is built in three sections. One of these is hinged to the casing by inside hinges, and the other two are hinged together as shown. The doors are closed merely by grasping the door knob and pulling it over to the other side of the casing, where an ordinary door lock is sufficient. The right-hand section is provided with two bolts, of the ordinary floor and ceiling type. These, in connection with the door latch and lock, are sufficient to secure the doors, unless one wishes to guard against forcing in the two left-hand sections by pressure applied to the joint between them. This may be taken care of by adding floor and top bolts to the left section, similar to those on the right one. The doors are opened merely by pulling on the chain which hangs from the top bolt, as shown. Thus the same motion which unbolts the door from the top, pulls it open. The section carrying the knob may have to be folded back separately, but this is the work of only a second. The dotted lines show the position of the doors when open.

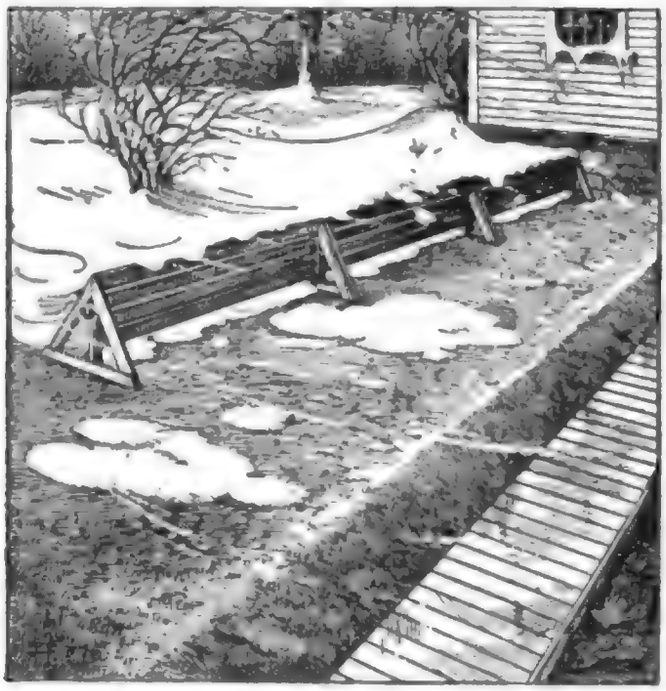
The satisfactory construction and operation of doors of this kind depends on the use and proper placing of the swivel hanger which is attached to the center section. At the top of this hanger are two rollers which work on a double steel track. This track should be built first, before placing the hanger. The doors are then closed, and the approxi-

mate position for the hanger determined by reference to the upper diagram. Then open the doors to the position shown by the dotted lines, and note whether this brings the center point of the hanger directly under the center of the track. If it does not, the position must be changed slightly. It will be noticed in doing this work that the distance of the hanger center from the door itself is determined chiefly by the closed position of the doors; the distance of the hanger from the hinged joint is determined by the position which the doors are to occupy when opened. The position of the hanger must, therefore, be worked out carefully by experiment, as indicated, before it is permanently screwed to the door section.

Such a door can be fitted with a lock of the same type as the door lock, so that it can be operated with the same key as the house door. The door works entirely on the inside of the casing, so that all parts of the mechanism are protected from the weather, and still but very little room inside the garage is required.

### Snow Fence for Preventing Drifts

When a wind blows over a deep snowfall, striking a bank at the bottom of



A Portable Fence, Which can be Quickly Set Up When Need for It Arises, Prevents the Snow from Drifting over the Walk

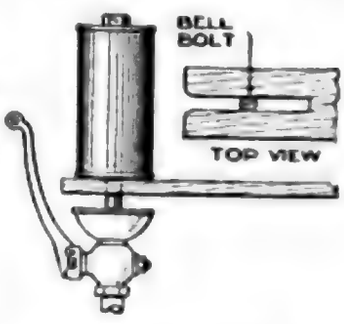
which is a sidewalk, the walk is pretty sure to be covered with a deep snowdrift, and efforts to shovel the snow off are not very successful as long as the wind keeps up. The illustration shows a portable fence, built in 8-ft. sections, each 3 ft. high, which will remedy this difficulty at the start. The fence is placed some little distance to the windward of the walk, and snow which blows over it will in most cases blow over the walk also. Snow which blows under it will not reach the walk. When the walk is at the same level as the rest of the ground, the fence should be set closer to the walk.—J. Horace Van Nice, Chicago, Illinois.

### Cleaning Water Pipes with Potash

Water pipes that are partly clogged may be cleaned by flushing them with a strong solution of water and potash. To introduce this solution, shut all faucets on the same branch, turn the water off at the cut-off, put the vessel containing the solution under the faucet spout, and open the faucet. The spout must be touching the liquid. Water draining from the branch, through the drain plug, causes a vacuum in the branch, which will draw the potash solution from the vessel into the pipes, thus flushing them thoroughly. But the faucet spout must be kept under the surface of the solution until the latter is all drawn in or until the suction ceases.—Ed. Shetzen, Atlanta, Ga.

### When Whistle Valve will Not Close

When the steam valve of a whistle becomes stuck, there is in some cases no method of shutting off the steam from the whistle, and it therefore continues to blow until the boiler is "killed." This happens quite frequently on a locomotive, either as the result of a broken valve or of dirt getting under the seat.




By the method shown in the sketch the noise can be greatly deadened. A forked stick or board is slipped under the bell of the whistle, and prevents the greater portion of the steam from entering the bell. The stick can be quickly cut from a scrap of wood, with almost any wood-cutting tool which happens to be handy.—F. W. B., Sioux City, Ia.

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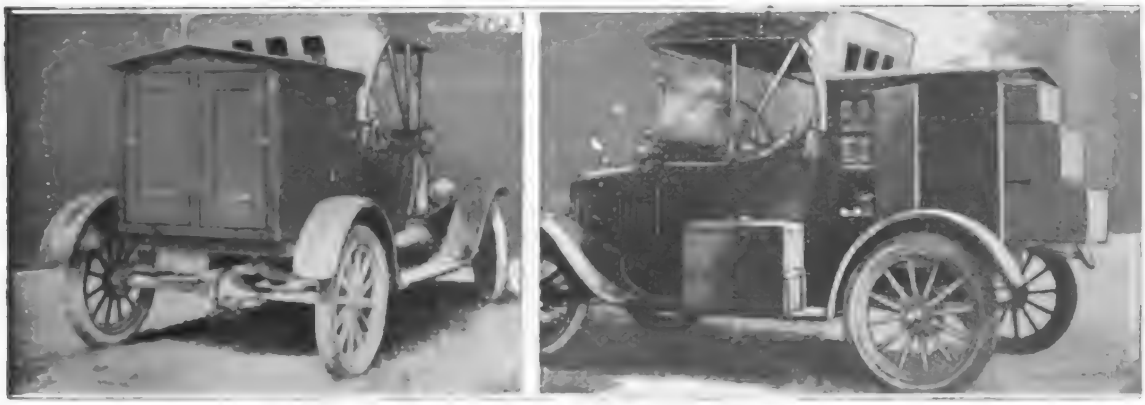


**Serving the Purpose of an Advertising Device as Well as That of Cheap Transportation, This Outfit is Used by a Salesman Traveling through Rural Districts**

## An Automobile Body for Salesman's Use

A Michigan salesman, whose customers were farmers living within a radius of 10 miles from his headquarters, needed a special body for his runabout, which would accommodate his stock neatly, and make it easy to display. The job was done at a cost of $23.10, and the result is shown in the photographs. The base of the cabinet is of 2 by 4-in. lumber, and is fastened by bolts to the chassis. These may be unscrewed at any time, and the body removed to make way for the regular runabout body.

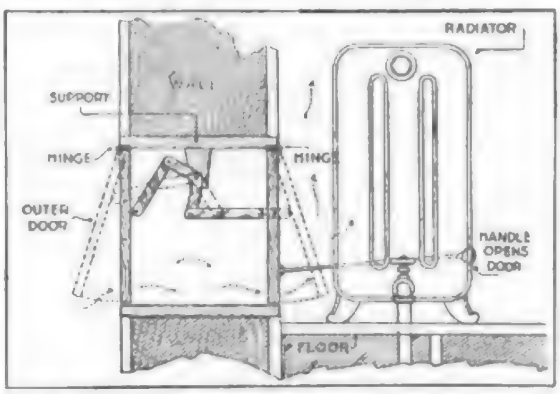
As shown in the pictures, there are three drawers on each side which pull out at the rear, and in addition there are compartments in the forward end of the cabinet, to which access is had by doors at the side. A piece of heavy oilcloth is tacked over the roof of the cabinet to render it waterproof. With this outfit, the salesman carries on a business upward of $7,000 a year.—Chester W. Shafer, Three Rivers, Mich.

## Razor Blade Makes Good Scraper

A double-edged razor blade, held between two pieces of thin wood or cardboard, with the edges ground square on an oilstone, makes a very good scraper which will hold the edge. The blade may be either glued or bolted between the two pieces of wood.—A. F. B., New York City.

## Ventilator Built behind Radiator

Few houses have sufficient fresh air in the winter. This condition would not be so general if adequate ventilators were provided to furnish fresh air without wasting fuel. Such a ventilator may be installed as follows: A small casing is fitted into the wall back of the lower part of the radiator. There are doors at the outside and inside of this casing, both doors opening away from the wall. The inside door is opened by pulling on a rod which runs between the sections of the radiator and ends in a loop. Between the two doors is an arrangement of iron links which has the effect of opening or closing the outer door at the same time the inner door is opened or closed. In this way any degree of ventilation desired can be obtained, within the limits of the opening of the doors. The air which comes in at the bottom of the radiator combines




**An Opening Made in the Wall, and Provided with Two Doors, Forms a Ventilator Which Insures Heating of the Incoming Air**

with the upper current of air through the radiator, and does not spread out over the floor as it would do if it were brought in at some other part of the room.

¶ Raisins, currants, or small fruits, can be easily washed by placing them in a corn popper, which is then held under a faucet.

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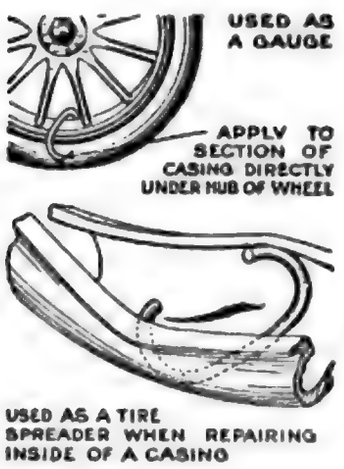
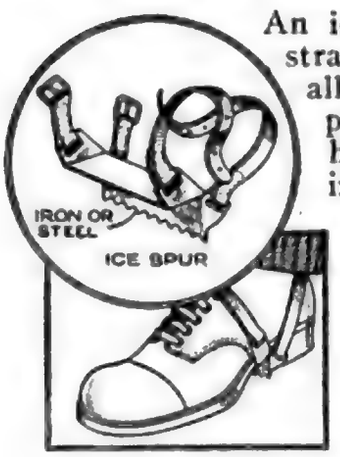
### Tire Spreader and Pressure Gauge

A piece of ⅜-in. iron rod, bent to the shape shown, is a handy appliance for holding the beads of a tire casing apart while making interior repairs, or patching. In addition, if made the correct size, it will serve as an inflation-test gauge. To accomplish this, pump the tire up to the right pressure, and measure the casing directly under the wheel hub, with the weight of the car resting on the axle. The distance between the points will not, of course, be standard for all tires, but will depend on the size of the tire being measured. A gauge of this kind has perhaps no great accuracy, but is far cheaper than the dial type, and as it only applies to one size, it is less likely to be stolen. Also, it is a much simpler operation to caliper the tires than to unscrew the caps and apply the pressure gauge.




### Spur for Walking on Ice

An ice spur, which is strapped to the foot, allows sharp points to protrude beneath the heel, thus preventing the foot from slipping on an icy surface. The spur is made from sheet steel, bent, sharpened, and fitted with straps, which hold it firmly to the foot.




### Poultry-House Lighting

Experiments made under a variety of conditions have shown that artificial light in poultry houses is a money-maker. By prolonging the days in late fall and early winter, the hens are induced to exercise longer and consume more feed, so that they lay eggs more plentifully; and in some cases large flocks have laid as many eggs in November and December, when eggs are scarce, as in the spring months of abundant supply. Different methods of producing the light have been tried, but most authorities are agreed that electricity is best, when obtainable.

If electricity is used, 50-watt nitrogen lights give excellent results, when spaced about 15 ft. apart along the center of the house. It is well to equip the lights with dimmers, thereby producing a sort of twilight, in which the birds are able to find the roosts. In this way the light is evenly distributed about the house, and is not too bright in any one spot.

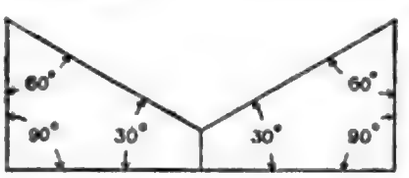
Kerosene lanterns have been used when electricity is not available, but these are hardly to be recommended. It is necessary to use several to give sufficient illumination, and there is considerable work to be done in filling and cleaning them, trimming wicks, etc. In addition, the fuel cost is higher.

The gasoline mantle light has been adopted extensively in the West. When the house is small, individual lanterns are used, or else a tube system. A four-light system, suitable for a 100-ft. house, has, until recently, cost in the neighborhood of $60 in that part of the country, which is far lower than in the case of kerosene lamps.

It must be borne in mind that the color of the walls is quite a factor, and that it pays to keep them white. When electricity is used, it is not difficult to arrange switches in such a way that the light can be turned on early in the morning without the need of a visit to the poultry house. Profits are, of course, increased by providing extra light at the beginning of the day as well as at the end, and clockwork may be used to turn on the current at the hours desired.

### Triangle for Isometric Drawing

A person doing much work in isometric drawing will find the triangle shown very useful. It has two 30° angles for the two horizontal axes of the isometric drawing, and the sides are both 90°, giving the vertical axis. Its use will be found to save much time, as just what is required is there, and nothing unnecessary is in the way.—S. B. Royal, Philadelphia, Pa.




¶An old silk-glove finger placed over a curtain-rod end will protect the curtain when the rod is slipped through the hem.

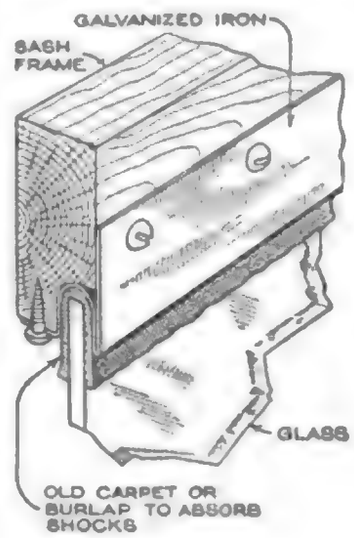
### To Prevent Radiator from Freezing

Autoists are often bothered in the winter by the freezing of the cold-water pipe leading from the bottom of the radiator to the lower part of the cylinder water jacket. If this pipe is frozen, and the engine is started, the water in the upper part of the radiator will soon boil, but as heat goes up, and not down, it will boil away before thawing out the frozen pipe. There is an easy method of remedying this, in a way that is entirely automatic. When the circulation is stopped, the boiling water is soon carried off in the small overflow pipe. If the lower end of this pipe is loosened from its fastening, and moved to a point directly at the base of the cold-water pipe, the heat of the steam will thaw out that pipe while the car is in motion. As soon as it is thawed out, the circulation is resumed.

If the overflow pipe is so located that it cannot be moved, the autoist should carry a section of rubber tube to slip over the end of the pipe, and so direct steam to any cold part of the radiator he desires. The steam flow will cease as soon as circulation of the water through the piping is resumed.

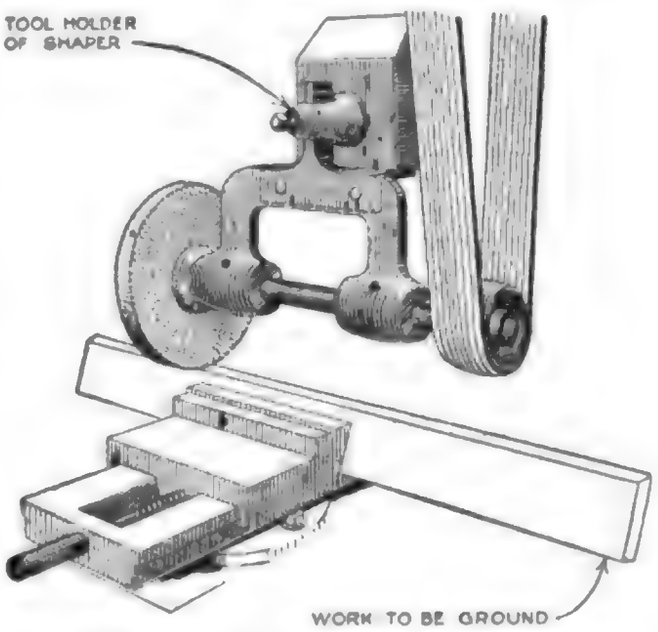
### Cushion Mounting for Window Panes

In cellar windows, where the glass panes frequently become broken, the method of holding the glass illustrated in the drawing may perhaps remedy the difficulty. Strips of sheet iron, preferably galvanized, are cut to the lengths of the four sides of the sash, and are formed to the shape indicated. The rabbet which receives the glass in the sash must be enlarged to take the iron strips. Some strips of burlap, or old carpet, are cut to fit around the edges of the glass, which is then mounted as shown. It will, of course, be necessary to fasten only one of the four iron strips at first, then place the carpet strips and sheet iron in position on the other edges of the glass before fastening these in position.




### Fixture Changes Shaper to Grinder

Desiring to sharpen some sheet-metal dies and shear blades one day, and having no machine for the purpose, our machinist rigged up a device which proved so satisfactory that it is now listed as one of the permanent fixtures in the shop.




**A Small but Solidly Built Fixture Converts a Shaper into a Surface Grinder When Required**

A small arbor, carrying a ½ by 6-in. emery wheel and a pulley, was mounted in a bracket made as shown in the sketch, and the end of the bracket was secured in the tool post of a shaper. A countershaft was hung about 10 ft. overhead, with the driving pulley directly over the arbor pulley when the latter was at the center of the shaper stroke. A 3-in. belt was used, the slack in the belt allowing enough play for the movement of the shaper.

A die, or shear blade, could then be clamped to the table, and after setting the grinder to the proper height and stroke, it would be sharpened accurately with very little attention from the machinist. On long shear blades, of course, the blade would have to be moved along to a new position in the vise, as the table reached the end of its travel.—C. M. Vaiden, Edgewood, Md.

¶To test manila rope, first free it from oil, then soak for 20 seconds in bleaching powder acidulated with acetic acid, rinse in water and alcohol, and expose for a minute to the fumes of ammonia. Manila fiber turns russet-brown, while all other kinds of rope turn cherry-red.

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# A Water-Power Dishwashing Machine

By F. D. BURKE

THE dishwashing machine here described can be built almost entirely in the home workshop, without the use of machine tools. If carefully constructed, it will do the same work as machines selling for five or six times as much as this one will cost to build. The material used is easily obtained and worked; it need not cost over $10. The power is supplied by a compact little water motor, built into the machine.

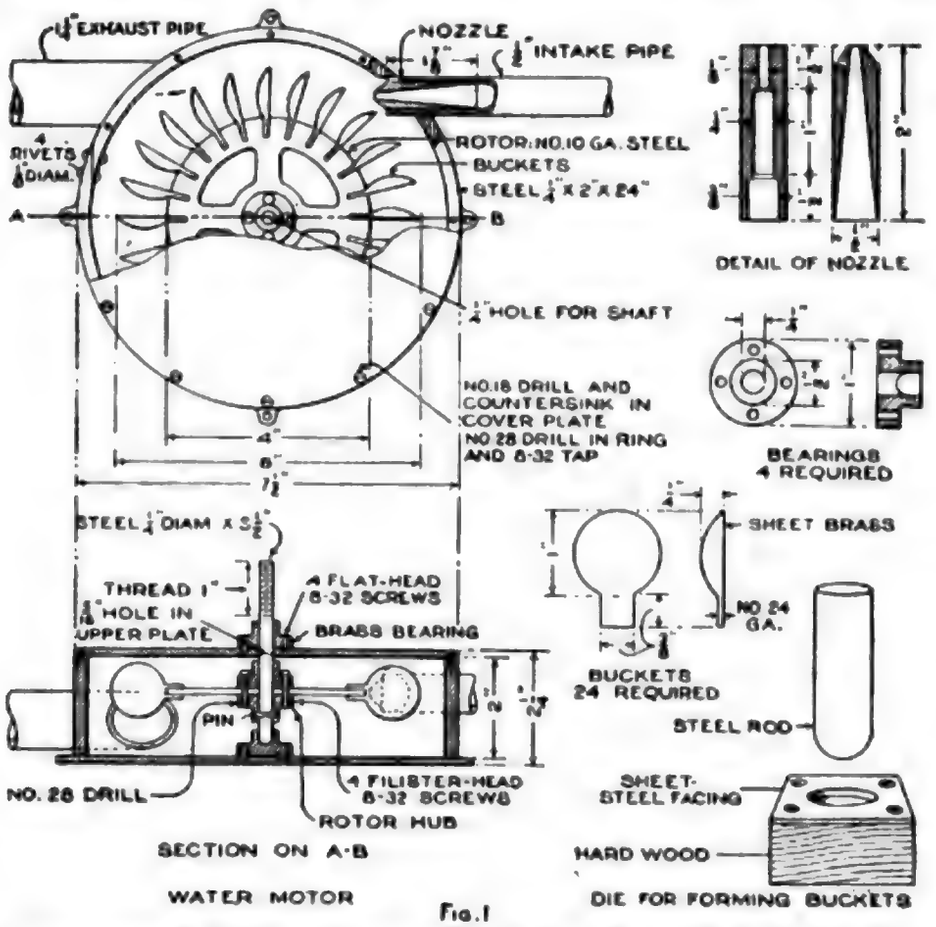



Fig. 1

**Construction of the Water Motor: Water under Pressure is Thrown by a Nozzle against Blades on the Wheel, Causing the Shaft to Revolve Rapidly. Blades, Bearings, and the Nozzle are Shown in Detail with Dimensions**

The design of the motor is adapted to allow it to work on water pressure as low as 40 lb. The construction of this motor, which entails the largest amount of labor, will be described first.

### Motor Casing

A piece of ¼-in. steel is first bent to form the large ring which constitutes the cylindrical wall of the motor. The two ends are filed and brought together, as shown in Fig. 1, and are fastened together by four rivets. After riveting, the joint should be soldered to make sure it is water-tight.

Next, the holes for the intake and exhaust pipes are located and drilled. The exhaust pipe must be larger than the intake pipe, as indicated; and must be set close to the lower side of the casing, to insure the easy flow of the water. Both pipes should make a drive fit in the frame. The length of the pipes will be governed by the diameter of the tank used, as explained below.

The two cover plates can be roughed out with a hacksaw, and finished with a file. They are then set in position on the heavy ring, and the 12 small holes for the screws, which hold the casing together, are located, drilled, and tapped, according to the dimensions given in the drawing. Only the bottom plate is provided with the four projections, or lugs, shown in the figure. These lugs are used to fasten the motor to the bottom of the tank.

### Bearings

The bearings are turned from 1-in. brass rod, to the dimensions given in the detail. Four such pieces should be made, three of them with the center hole clear through, and one with the center hole blind, ending in a round bottom, as shown by the curved line in the detail. One of the three pieces is used as the upper bearing, while the other two form the rotor hub, as described below. The bearings are alined in the following manner: Mount the lower bearing in the exact center of the bottom plate. Screw both plates to the heavy ring. The propeller shaft is pushed through the hole in the center of the top plate, and into the lower bearing. The upper bearing is then placed on the shaft, and pushed against the top cover. Since the hole in this top cover is drilled oversize, the shaft can be moved around slightly until a position is found where the upper bearing can rest tightly against the cover plate without grinding on the shaft. In this position the bearing should be fastened; mark the positions for the four holes on the cover plate, remove this from the other parts, and drill the holes.

### Construction of Rotor

The rotor consists of 24 small blades, or buckets, mounted in slots cut in a steel disk. These slots are, of course, spaced equidistantly around the disk. They can be cut out to the dimensions shown in the detail, with hacksaw and file. Large holes may be made in the disk to lighten it, as illustrated, and a hole is made exactly in its center to take the shaft. The hub consists of two pieces of brass, identical with the brass bearing on the upper side of the casing. The shaft should be forced through the hole in the disk; the hub pieces are then slipped over the shaft, and fastened in position with screws, as shown.

The buckets are of sheet brass, and should be laid out by means of a pattern, cut to the dimensions given in the detail. The cup shape may be given them by driving the circular part into a simple die by means of a steel rod, shaped to form a round punch. The punch may be driven into the die with a heavy hammer, or pressure may be applied by means of a vise. The finished buckets are set in the slots in the motor disk, as shown, and soldered.

### Nozzle

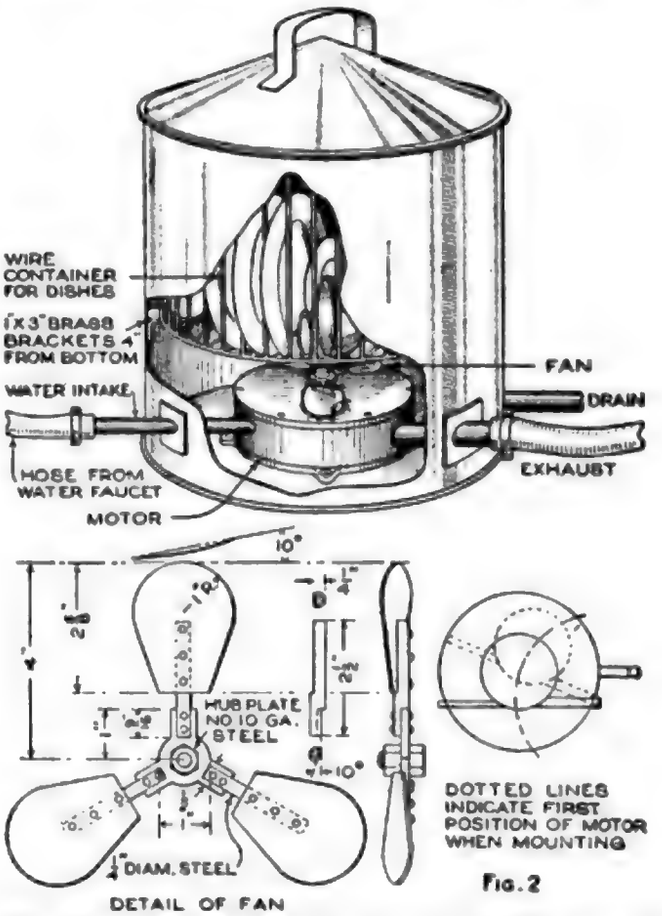
The construction of the nozzle is clearly shown at the upper right in Fig. 1. Holes are first drilled in it with three different sizes of drill. The bore is then finished to a smooth taper by reaming; if a taper reamer is not available, a worn-out round file can be ground to the proper shape for this purpose. The nozzle should make a drive fit in the intake pipe. It should be forced in, and the projecting end finished off with a file.

### Final Assembly of Motor

In the final assembling, care should be taken to adjust the nozzle and rotor so that the stream of water from the nozzle will strike the exact center of the buckets. The rotor is then fastened to the shaft with a small steel pin, as shown in the sectional view. The intake and exhaust pipes should be well soldered in the frame. Heavy paper gaskets, well shellacked, should be placed between the cover plates and frame, to insure water-tight joints.

### Fan Construction

Figure 2 shows in detail the construction of the fan, which drives the hot water against the dishes to be washed. The hub plate is mounted on the propeller shaft between two nuts. The plates are set at an angle of about 10° to the hub plate, and should be slightly curved to give best results. They are




**The Fan and the Completed Machine: Hot Soapy Water is Thrown in a Fine Spray against All Parts of the Dishes, Cleaning Them Thoroughly**

riveted to the steel arms, which are, in turn, riveted to the hub. After the fan is completed, it should be trued up by bending the plates, so that they follow each other in a perfect circle, and have the same shape.

### Tank

The tank, or container, should be of heavy-gauge tin, 16 to 18 in. in diameter, and about the same depth. It should be fitted with a water-tight cover. Such a container can be purchased wherever cooking utensils are sold. The dishes are placed in a wire cage, which is supported on four brackets, made from sheet steel. These are riveted and soldered to the inside tank. For draining purposes, a short length of brass or copper tubing is soldered into the side of the tank, quite close to the bottom. This pipe should be fitted with a cork or wooden plug.

### Assembly of Complete Machine

The complete machine is shown in the upper drawing of Fig. 2. The motor is first put in, so that the projecting intake and exhaust pipes are on a line

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with the greatest diameter of the tank. The exhaust pipe is pushed through the hole cut in the side of the tank, next to the drain pipe. The motor can then be moved until the intake pipe lines up with the hole cut for it. When the motor is moved to its final position in the center of the tank, both pipes should project at least 1 in. from the sides of the tank. Four copper rivets are used to fasten the motor to the bottom of the tank. These rivets are inserted from the underside, and the heads should be well soldered. Two small squares of heavy-gauge tin are fitted over the intake and exhaust pipes, and soldered to the outside of the tank, as shown in the figure. All parts of the machine which are made of steel should be heavily nickelplated before the final assembly. Any of the steel parts can be made of brass, if made somewhat heavier, but even with brass, it is desirable to plate the parts well with nickel.

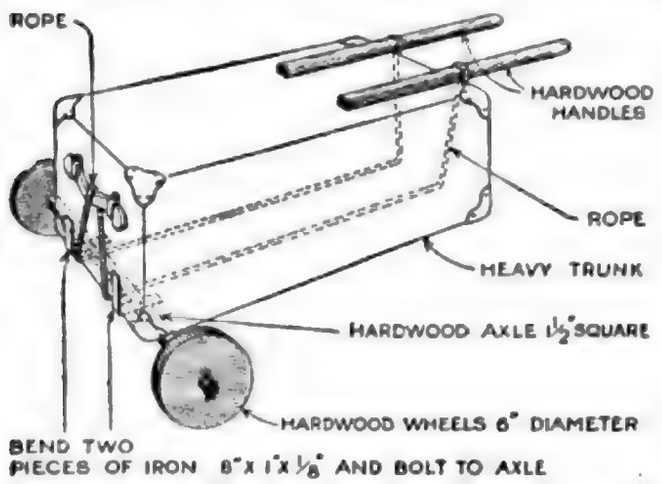
A short length of rubber hose is fitted to the exhaust pipe. A longer piece of hose is fitted to the intake pipe. The free end of this piece should have a suitable connection for attaching to the cold-water faucet.

**Operation of Machine**

The machine should be conveniently located on a shelf or stand next to the kitchen sink. The hose leading to the intake pipe should be connected with the cold-water faucet; the exhaust should be arranged to flow into the sink. The tank is half filled with hot water, to which is added a small quantity of soap powder. The dishes are stacked on edge in the wire basket. The silverware may be placed in a small container in the center. The full basket is then placed in the tank, the cover put on, and the motor started. The swiftly revolving fan throws the soapy water up through the dishes with a whirling motion, and thoroughly cleanses them. After running five or six minutes, the tank is drained, and refilled with clear hot water. It need only be run a minute or two for rinsing. The tank is again drained, and the motor started a third time, the propeller acting as a fan, and throwing a blast of warm air up among the dishes, which dries them.

## Compact Truck for Trunk Moving

The illustration shows a very simple and cheap truck for moving a trunk over smooth floors or ground. The truck consists merely of two stout hardwood handles, an axle with two wooden wheels, and the rope connection. The axle is provided with iron angle pieces to keep the trunk from slipping forward; these should extend back far enough to keep the axle from revolving, and thus letting the trunk slide forward. The length of the rope depends of course on the size of the trunk to be hauled, and the rope must, therefore, be tied again about one of the handles each time the device is adjusted to a new size of trunk. The great virtue of this arrangement, besides its simplicity and low cost, is the fact that it can be packed into small space.




**A Simple and Cheap Collapsible Truck Makes It Easy to Move a Trunk over Smooth Floors or Ground**

## Whisky Barrel as Barrow Wheel

On sandy soil or rough ground, where an ordinary wheelbarrow is of little use, a barrow furnished with a light wooden roller instead of a wheel can give good service. An excellent roller for the purpose can be made out of a discarded whisky barrel, and many of these have lately gone into the discard. The barrow frame will be rather different from those usually seen, as the two arms at the front which carry the axle bearings must be far enough apart to admit the barrel. A barrow of this kind was used to haul driftwood out of the dry bed of a stream, and was pushed without difficulty over rough surfaces and very soft ground. In places where the watercourse was flooded, it was found that the empty barrel was buoyant enough to float the barrow, even when heavily loaded.

¶ Good chicken troughs can be made by splitting worn-out wooden pump tubes, and closing the ends and the spout hole.

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### Light Removes Particles from Eye

Small foreign bodies which are not imbedded in the eyeball may often be removed by going into a dark room, looking up toward the lighting fixture, then turning the light on quickly. If the light is strong enough, it will cause a violent reaction which will cause the particle to be washed to the corner of the eye. It is then easily removed by means of a clean handkerchief.—Frederick C. Davis, St. Joseph, Mo.

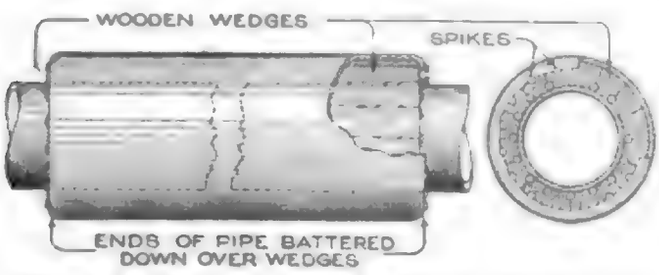
### Fire-Bucket Sign Prevents Misuse

Fire buckets are usually hung high to prevent use except in case of fire. By making a float of cork, and attaching a small cardboard sign, reading "O. K.," to the upper part of the cork, a workman will readily see whether the bucket needs replenishing or not, and will be still less likely to use the bucket for any purpose for which it is not intended.—J. H. Moore, Toronto, Can.

### Repair for High-Pressure Pipe

A rough-and-ready splice for large pipes, which requires no special fittings and can be applied in an emergency, is shown in the illustration. A piece of pipe, 1 or 2 in. larger than that to be spliced, is slipped over the mains, and is centered over the break. Wooden wedges are driven in all around at both ends, being spaced so that the sleeve is held at a uniform distance from the main at all points. When the wedges are all tight, the ends of the sleeve are battered down all around, so as to overhang the wedges and hold them in. Finally spikes are driven into the wood as shown, to tighten up the wedges.

Besides stopping the break, this type of joint also acts as a compensating link for offsetting the effect of expansion and

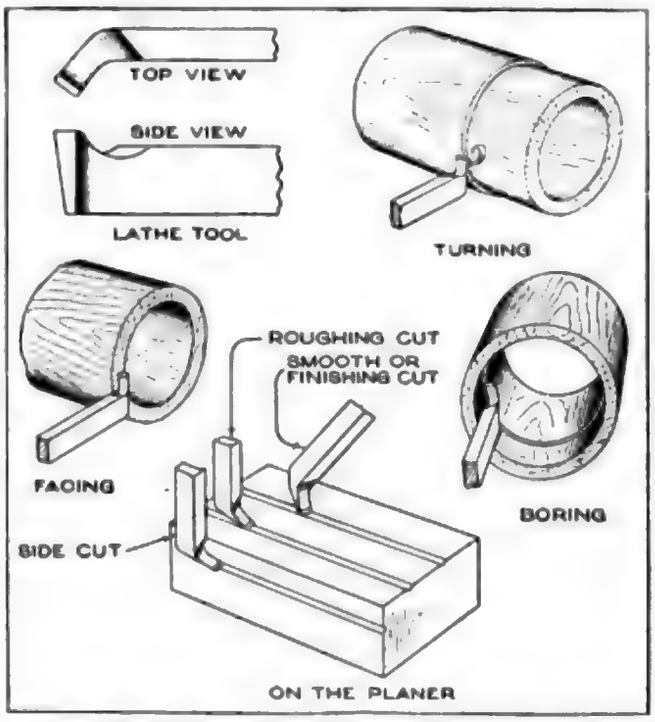



**A Pipe Splice That can be Made from Scraps of Heavy Pipe and Wood, Is an Interesting Expedient in Emergencies**

contraction in the main, thereby preventing further breaks.

### A Multiple-Purpose Lathe Tool

The job worker who gets tired of having to keep a large number of tools in




**A Few Tools Forged and Ground to the Shape Indicated, will Take the Place of a Number of Special-Shaped Tools**

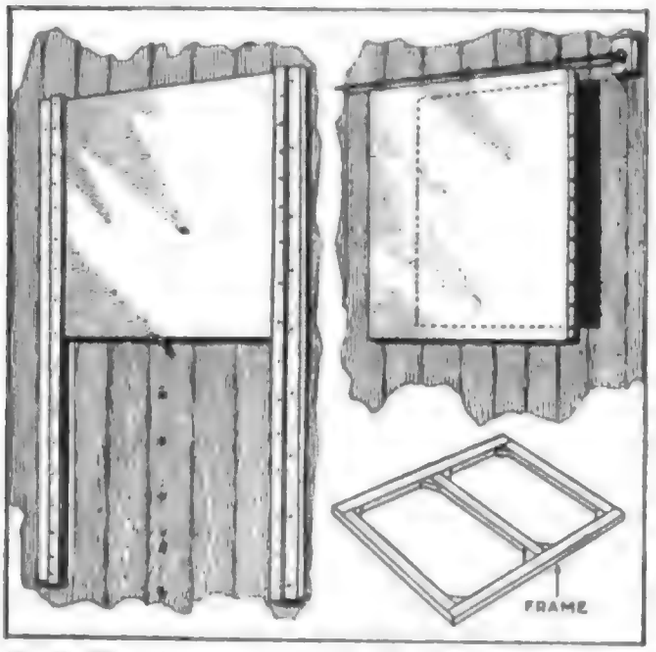
condition in order to be ready to handle an occasional lathe job, will find the tool illustrated a very interesting one. With it he can handle a wide range of work, especially if both right and left-hand tools of this type are provided.

The tool is shaped as shown at the upper left in the picture; it is quite important that the corners be beveled off slightly, so that a smooth surface will be left on the work, even when taking roughing cuts. The large variety of operations in which it can be used is suggested in the other views. The tool is very rigid, so that heavy cuts can be successfully taken; it is economical, as it eliminates the necessity of having several other tools; it is not at all difficult to forge, and when it has been worn down by repeated grindings, it is easily dressed. Many tools, on the contrary, are of such shape that, when worn out, it is impossible to dress them without cutting off and wasting considerable steel. Not the least of the advantages of this type is its long life, as both corners are used, one for turning and the other for boring.

The angle of the cutting edge, as illustrated, is right for low-carbon steel and cast iron; for working wood and brass, the angle will have to conform to the usual practice in cutting those materials. —M. L. Lowrey, Livermore, Calif.

### Poultry-House Ventilation

Poultry raisers have come to realize that the ventilation of the poultry house is a very important matter. There must




**Muslin Ventilators can be Used in the Poultry House to Secure Abundance of Air without Either Drafts or Extremes of Temperature**

be an abundance of fresh air without extreme heat or cold, and without dampness and drafts. Proper conditions cannot be had with the makeshift, wrongly used ventilators frequently employed.

One method, which has proven successful, is to use the straw air strainer. A second ceiling is built, about 6 in. below the regular ceiling, in the form of a latticed framework. A trapdoor in the center of this makes it possible to change the straw which is packed between the lattice and the original ceiling. Vents, or wide, low openings, must be cut in the sides of the house as close under the eaves as possible. The air, entering at these vents, filters through the straw, and thus into the poultry house. No drafts are possible, and the temperature is kept very nearly constant. The straw also absorbs a great deal of moisture.

Another method, in rather wide use, is to cover an ordinary window frame with muslin, instead of using glass. An improvement on this type of ventilator is shown at the right in the drawing. A light wooden frame covered with muslin is hung from a wire, which serves as a track. The frame can thus be moved sideways, over or away from the window opening. Screw eyes on the frame allow it to slide easily over the wire. The wire itself may be fastened either to screw eyes or over blocks at either end. To the left is shown a similar frame, moving up and down. In this case it will be necessary to arrange some means of holding the frame at the height desired. Either pegs that fit into holes in the wall, or a hook fitting into screw eyes, placed at various heights in the wall, may be used for this purpose.

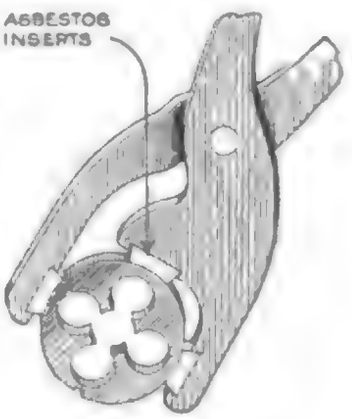
The advantage of the air strainers over muslin-covered frames is that the latter have to be adjusted accurately to the weather, while the air strainer requires no attention whatever.—J. T. Bartlett, Ft. Collins, Colo.

### Hauling Christmas Trees

Christmas trees, which are dragged in on a sled over the snow, are often so badly injured on one side that this side has to be placed against a wall when the trees are set up. As it is usually preferred to set the tree in the middle of the room, the breaking off of branches should be avoided. This can be done, if the tree is placed on the sled with simple trusses on which the main trunk of the tree rests directly, thus taking the weight from the branches.

### Tongs for Hardening Round Dies

In hardening round threading dies, they are often found to spring out of shape, or to crack across the narrow portions of the steel. This can be avoided by the use of a special pair of tongs made like the sketch, and as here described:




The dies are made in the usual way, and the opening for adjustment is cut only partly through. The tongs have asbestos inserts, spaced to grip the die on the thin parts, as shown. Held in the tongs, the die is placed in the fire, and heated to a cherry red, then quenched in oil or water. The asbestos inserts retard the cooling process on the thin parts, leaving them with the desired spring temper, and preventing cracking. The die is next drawn to temper in hot oil or on a plate, as usual, and when cold the remainder of the slot is cut through with a thin grinding wheel.—Violet Johnson, Rockford, Ill.

### Antique Mahogany Furniture

Unfinished mahogany furniture can be given the appearance of old mahogany by applying bichromate of potash dissolved in water. The shade is regulated by the strength of the solution, or by varying the number of coats applied. The surface of the wood tends to become rough when the solution touches it, owing to the presence of water in the mixture, but it can be restored by using sandpaper after each coat of the solution has thoroughly dried. This is an excellent method of staining inlaid mahogany, as the solution has hardly any effect upon the wood used for the inlay. When other methods are employed, it is generally necessary to protect the inlay with shellac, or to prevent the stain from passing beyond the edges of the inlaid portion, which will otherwise assume the same color as the rest of the wood. A light, soft brush is necessary in the latter case.

This method of staining can save the amateur cabinetmaker a good deal of trouble, when repairing mahogany furniture, if he has difficulty in matching the original piece. He can give the surface uniformity by using wood of a fairly light color, and deepening the shade with repeated applications of the same solution. —Chas. A. King, East Kingston, N. H.

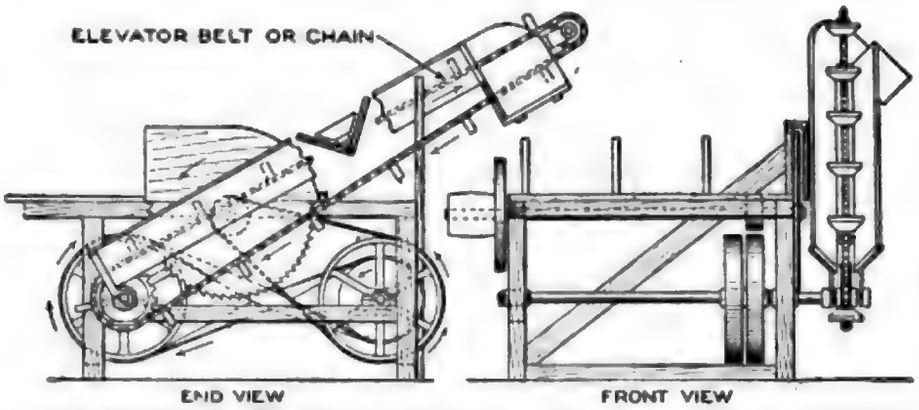
### Oilcan with Flexible Spout

An oil feeder with a flexible spout can be made at very slight expense by soldering one end of a narrow piece of lead pipe to the screw top of a small oil container, and beating the other end to a taper point, leaving a hole just large enough for the oil to escape. Or a spout can be taken from a small feeder and fastened to the pipe, making the hammering process unnecessary. The lead pipe can be bent to almost any angle, and will be found a great convenience in reaching awkward places.

### Elevator for Portable Saw Frame

By the use of an elevator like that shown in the accompanying drawings, the labor of one man is saved.

As soon as a length of wood has been cut off, it drops directly into the chute, whence the chain carries it to the upper end, discharging it upon a short incline, from which it drops to the pile. A considerable pile of wood may thus be cut before moving the outfit ahead to a new position.




**An Endless-Chain Elevator, Built onto a Saw Frame, Makes It Unnecessary to Have a Man to Take the Pieces of Wood as They are Cut, and Throw Them to the Pile**

The elevator consists mainly of a V-shaped chute, at the end of the saw bench and running up beside the saw. Through it runs a chain belt, driven by a small sprocket on a countershaft, which in turn is driven from the mandrel by means of other sprockets and a chain, as shown. To the elevator belt are attached, at suitable intervals, wood blocks made to fit the inside of the chute. The elevator is held in place at the lower end by two hooks formed of malleable iron engaging the countershaft, one on either side of the sprocket, and at the upper end by a long wooden piece, or other suitable support. Of course, hard and fast rules for constructing one of these elevators cannot be followed in every case, due to wide variation in the construction of cut-off saws, but the man handy with tools will find little difficulty in adapting this convenience to any particular frame.

With the wood to be cut piled horizontally, one man can operate such an outfit alone if desired, and make very satisfactory progress.—Arthur J. Dunckel, Dolgeville, N. Y.

¶Flowers may be preserved by dipping quickly in molten paraffin. Leaves must be coated with green wax. White or light-colored flowers take this treatment best.

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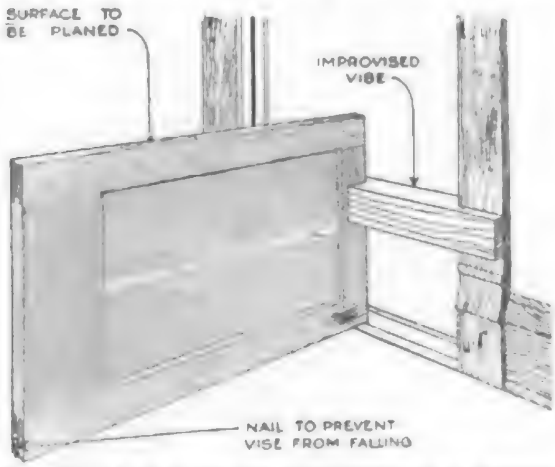
### Handy Vise for Planing Doors

Carpenters are often called upon to do odd jobs such as planing doors that have




**The Door is Held Upright for Planing by a Notched Piece of Board Which Fits against the Door Casing**

swelled. Usually the task is made more or less difficult by the absence of vise or workbench. A simple vise can be quickly made by cutting a notch in the center of a scrap piece of 2 by 4-in. lumber, then notching the ends to fit in the door casing. The door is taken from its hinges, and placed against the 2 by 4-in. piece, with the end of the door fitted into the notch cut. A nail driven into the floor at the other end of the door holds the door tight against the vise and prevents it from falling.—H. K. Capps, Stahl, Missouri.

### Notches Help Lathe Dog to Hold

Work held in a lathe dog often slips around when a heavy cut is taken off the stock. Notches filed into one side of the dog will usually prevent the recurrence of this trouble.

### Sandpaper Holds Whetstone

Place a piece of sandpaper, sanded side down, under the whetstone, on the top of the workbench. Turn the edges of the paper up a trifle, and the stone will not slip, because it is held to the paper by suction as soon as pressure is applied on the stone, and the paper is kept from slipping on the bench by its rough surface. Also, the paper will catch the oily discharge and thus keep the bench clean.

### "Don'ts" for the Furnace

Don't shake live coals into the ash pit.

Don't let ashes collect under the grates.

Don't shake down the ashes too much in mild weather.

Don't forget to shake them down thoroughly in cold weather.

Don't forget that the fire needs air in order to burn.

Don't admit so much air that it becomes chilled.

Don't let too much air in above the fire; it needs very little.

Don't let partly burned gas escape from the fire, owing to a lack of air to burn it.

Don't believe any manufacturer who says his furnace will burn air. It won't.

Don't disturb the fire any oftener than necessary, especially with hard coal.

Don't use twice as much coal as necessary, merely because you haven't studied your furnace.

Don't let clinkers collect in the fire; every few days run a poker through it, find the clinkers, and remove them.

Don't let clinkers stick to the grates or the sides of the fire pot, or the iron may become burned.

Don't fire the furnace too often; give it plenty of coal three times a day, and leave the fire alone in the meantime.

Don't let the fire become thin in order to save coal. Let the fire come even with the bottom of the fire door, and if the weather is mild, use the dampers.

Don't leave the damper in the fire door open more than 20 or 30 minutes after hard coal is placed on the fire—45 minutes for soft coal.

Don't forget to use the ash-pit damper and the chimney damper in conjunction with each other. When opening one damper, close the other. Both control the admission of air to the furnace.

Don't neglect to attend to the fire carefully at night. About half an hour before the fire is to be checked for the night, remove the ashes thoroughly from the fire, and from the ash pit. Put enough coal on the fire to cover it completely, and shut off the dampers.

Don't move the dampers oftener than necessary.

Don't worry about the furnace.

¶When a large hole is to be bored quite accurately with an expansive bit, first make a hole at the center just slightly smaller than the feed screw on the end of the expansive bit. Then proceed with the large bit, taking a fine cut.

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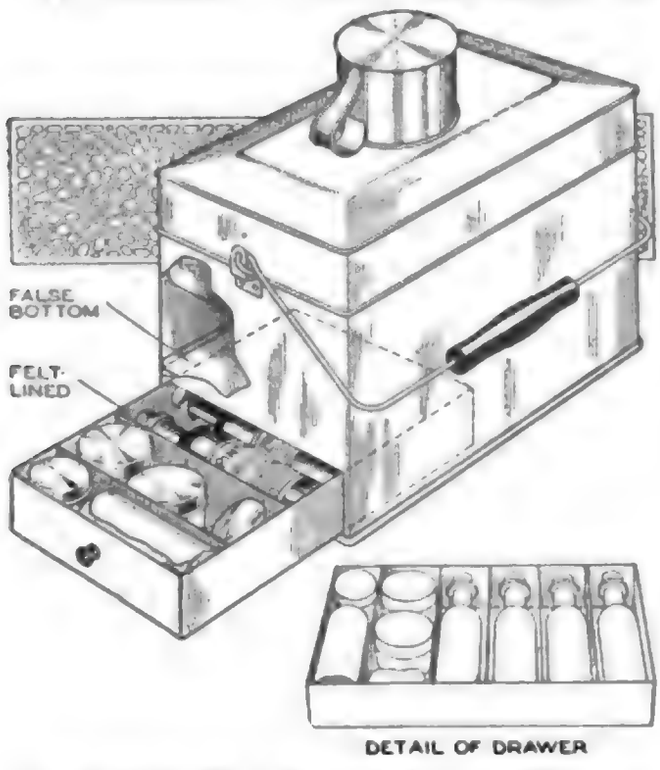
## First-Aid Kits for the Mechanic

Every mechanic is likely at some time or other to be the victim of an accident which makes necessary the use of antiseptics, pain allayers, or dressings. It may be that he only "barks a little skin off his finger," but if uncared for this may prove serious.

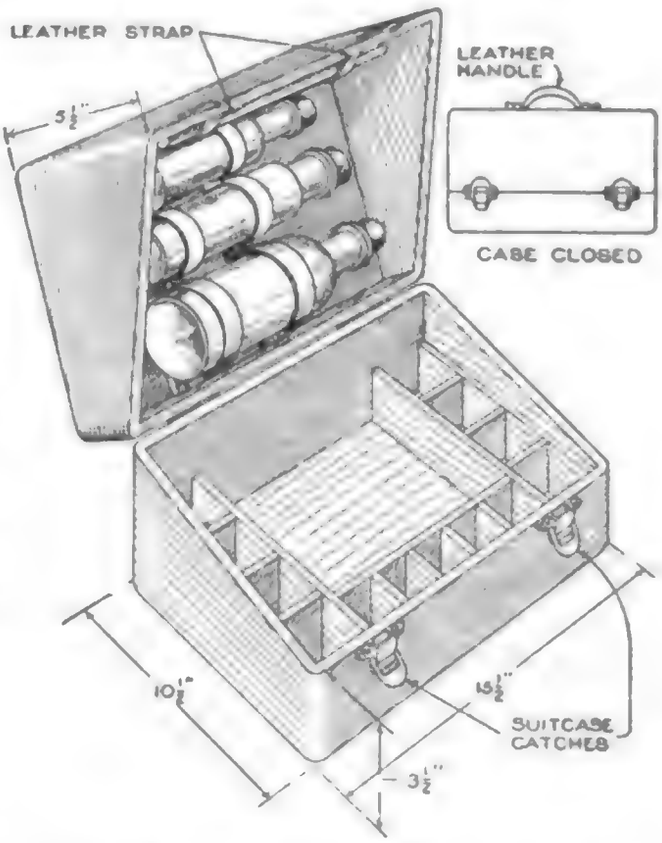
The two types of first-aid kits shown in the drawings were designed to meet the needs of both the shop worker and the mechanic employed on outside jobs. An addition to the ordinary dinner pail provides the mechanic with the necessary articles, wherever he may be working, while the more pretentious outfit is especially valuable in the shop, where many minor cases require attention each day.

A tin false bottom, soldered about 1½ in. above the regular bottom of a dinner pail, provides room for a sliding drawer, also made of tin. The metal between the two bottoms must be cut out at one end, to provide for the insertion of the drawer. Several divisions in the drawer hold the various articles separate, always just where they can be grasped quickly, and protected from either breakage or contamination. Further protection is secured by lining the drawer with heavy felt.

The contents of such a kit should include the following: Adhesive tape, gauze bandage, aseptic cotton, petroleum jelly or vaseline, powdered alum or bicarbonate of soda for acid burns;




**The Mechanic Working Away from the Shop may Carry His Own First-Aid Supplies in the Bottom of His Dinner Pail**




**A Wooden Case Provides a Portable, Yet Completely Equipped First-Aid Kit for the Machine Shop**

bottles of turpentine, peroxide, iodine, and oil for burns, and other articles to suit the mechanic, such as scissors and finger cots.

For shop use a larger and more complete equipment is desirable. This may be handled quickly and effectively if stored in a wooden case such as shown in the drawing. In the lower half of the case are compartments for the various articles, while straps looped in the upper half of the case hold the bottles and the brush, which are useful parts of the equipment.

The contents of this kit should include the following: Arnica, carbolic acid, peroxide, green soap, cholera mixture, aromatic spirits of ammonia, essence of peppermint, iodine and brush to apply it with, vaseline, adhesive plaster, absorbent cotton, several widths of gauze bandage, medicine glass and spoon, scissors, tourniquet, and one of the many good first-aid books.

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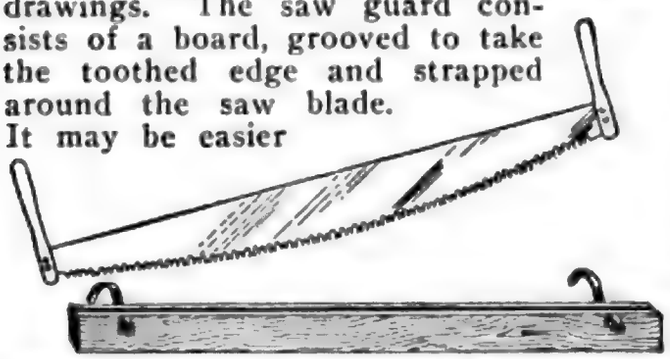
¶The tick of a watch placed on a table top may be deadened by placing an inverted glass tumbler over it, so that it may readily be seen but not heard.

### Guards Protect the Saw and Ax

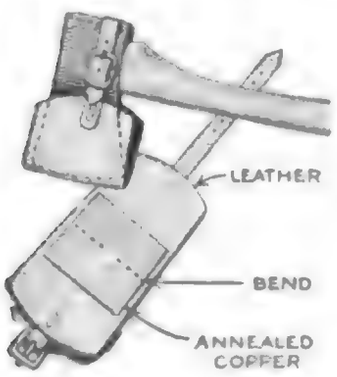
In carrying a long crosscut saw, or even an ax, a long distance, there is always some danger of accident, especially if the person carrying it stumbles or comes in contact with branches of trees. In the interest of safety, it is therefore desirable to cover the sharp edges, and means for doing this are shown in the two drawings. The saw guard consists of a board, grooved to take the toothed edge and strapped around the saw blade. It may be easier



A Saw Guard of This Type Not Only Makes Carrying Safer, but Eliminates the Springing of the Blade Which Makes a Saw Hard to Carry

to make the guard of two boards, beveled with a plane and nailed together, but in this case care must be taken that the saw teeth do not cut their way through and come in contact with the nails. Besides making for safety, this guard makes the saw easier to carry, as the board stiffens the blade and does away with the springy motion usually so troublesome.

The ax guard is made of a piece of leather taken from an old shoe or some other piece of stiff, heavy leather. To avoid cutting the leather, it is well to mount a sheet of very soft copper at the place where the edge would otherwise come in contact with the leather. The guard is strapped over the blade in the same manner as the saw guard.

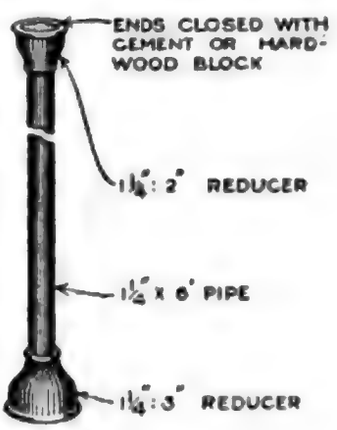



### How to Make Printers' Rollers

Wishing to reduce operating expenses, a printer adopted the practice of re-covering his rollers in his own shop, instead of sending them out. As the rollers were small, he used the metal tube of a bicycle pump as a mold, and mixed the compound himself. The operation is not difficult, but a little experimenting with the compound is necessary before the proper resiliency is attained. To make the compound, add ¼ pt. of glycerin and ½ pt. of table sirup to 1 lb. of shell glue. Put the vessel containing the ingredients into a metal pot with water in it, and boil on a very slow fire, stirring constantly, so that they will be thoroughly mixed. When the right consistency is reached, the mixture will congeal quickly around a stick thrust into it, after taking it off the fire a moment. Before it is ready for use prepare for the molding operation. If a bicycle pump tube is to be used, thrust one of the ends into a large potato, so as to make an impression ¼ in. deep. In the center of the impression make a still deeper one, by thrusting in the end of the roller core as far as the shoulder. Oil the inside of the tube thoroughly, and set it in a vertical position on the impression in the potato, with the core running upward through the center. Another potato is held in readiness, to be used as a cover on the upper end of the tube, with impressions of the tube and core corresponding to those in the potato at the lower end. Pour in the compound, filling the tube to the top; place the cover in position, to keep the core in the center, and let the mixture stand until it is completely hardened, which will take five hours, or a little more Take off the potatoes, and push the roller out of the tube by means of the core.

### Post Tamper of Pipe Fittings

A durable post tamper is made from a 6-ft. piece of 1¼-in. pipe, fitted at each end with reducing couplings, which are closed with cement, or a block of hard wood driven in tightly. One end is made 3 in. and the other 2 in. in diameter, to adapt it to varying conditions. A tamper made in this way is convenient in size and weight, and is also very effective for the purpose for which it is intended.



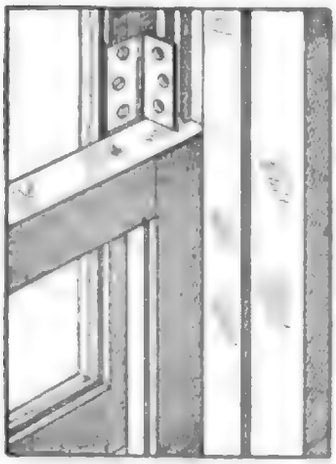

¶The stopper of a glue bottle may be prevented from sticking by rubbing a little lard on it before the glue has touched it.

### Removing Scale from Steel Tubing

The process of welding develops a heavy scale on steel or iron, which is easily removed by sandblasting, chipping, or pickling the welded article. But if steel tubing is welded, the scale formed inside of it is hard to reach; only reaming will properly do the job, and this usually spoils the reamer.

A good way to get the scale out is to heat the tube to a black heat, and then plunge it in cold water. The sudden contraction of the metal loosens the oxide scale, which can then be easily scraped out with a round file.

### Butt Hinge as Window Stop



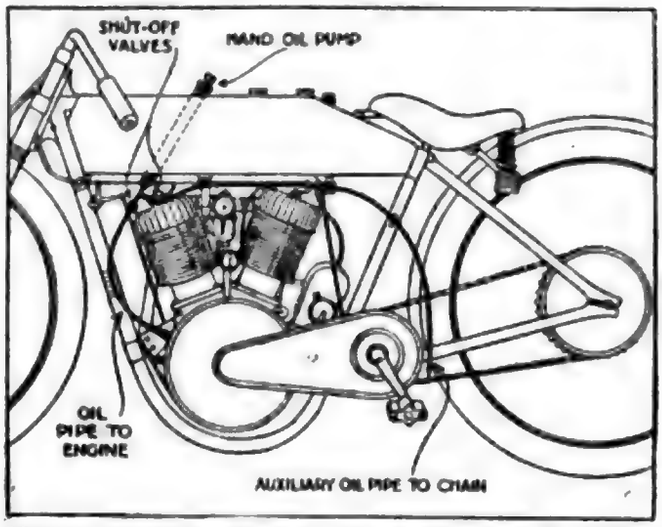
A simple window stop which locks both sash is made by setting a butt hinge flush into the upper sash. When the hinge is open, as shown, neither sash may be opened past the hinge, thus keeping out burglars or other intruders.

### Typewriter Cleaned by Compressed Air

Cleaning a typewriter with a brush or cloth is a long and tedious operation, and the job is hardly ever done thoroughly, as there are many parts of the mechanism which are very difficult to reach. With compressed air the work can be done in a short time, and a moderately strong blast will remove the smallest particles, so that a very complete cleansing will be accomplished. Automobile garages are now so numerous that nearly every one has access to compressed air, and it is worth while to take the typewriter to the garage whenever the mechanism becomes clogged with dust and fragments of eraser.—Paul L. Fetherston, Milton, Wis.

### Motorcycle Drive Chains Oiled While Running

If no provision is made for oiling the drive chains of motorcycles, the result is that, before the end of a long trip is reached, the chain becomes dry, thus wearing the rollers, connecting pins, and sprockets. The drawing shows a way of oiling the chain while on the road. It

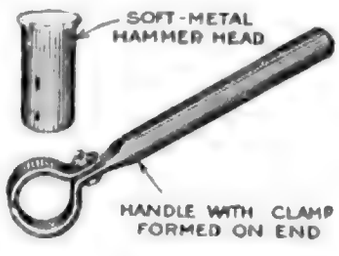



Motorcycle Drive Chains may be Greased by Introducing an Oil-Pipe Line from the Pump Used to Inject Lubricant into the Motor Base

saves much trouble and requires little attention. Most motorcycles are provided with hand pumps for injecting oil into the motor base. A Y-pipe connection inserted in the pipe which leads from the oil pump to the motor base is fitted with shut-off valves in each branch. From one of these a pipe conveys the oil to the motor base, as originally. The other pipe leads to a point just over the lower stretch of the long drive chain. With this arrangement, it is easy to oil the chain by opening the valve in the pipe leading to the chain, closing the valve leading to the motor base, and giving the pump handle several strokes. Such a change in the oiling system will prove a great convenience and may in the end save considerable expense.—John E. Hogg, Alhambra, Calif.

### Handle for Soft-Metal Hammer

A scrap of steel tubing will provide material for the handle of a soft-metal hammer to be used for driving in taper-shank drills, and for similar purposes. One end of the tube is flattened, bent around, as shown, and fastened with a small bolt or machine screw. The hammer head, of lead or babbitt, can be molded in a hole drilled in a wooden block with an expansive bit. When the head has been too much battered to be of further use, it can be easily removed and remolded.

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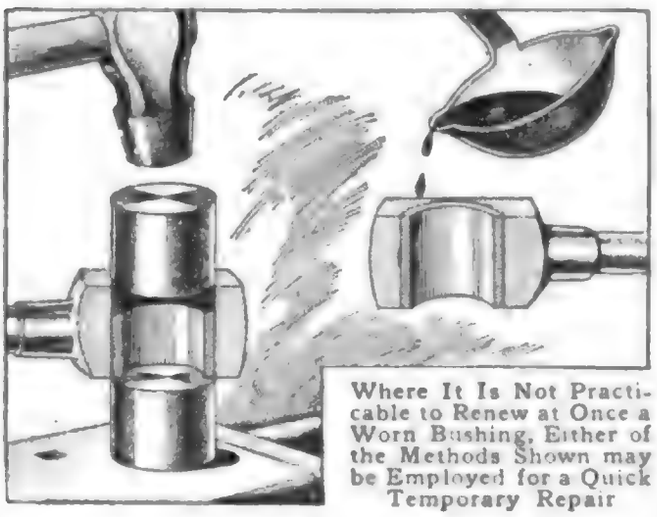
### Removing Play in Bushings

The renewal of each bushing in the jointed connections of an automobile involves considerable work, especially if any sizes are required that necessitate lathe work.

Bronze bushings will respond to end pressure sufficiently to close the bore, or



Where It Is Not Practicable to Renew at Once a Worn Bushing, Either of the Methods Shown may be Employed for a Quick Temporary Repair

central hole, and for this reason a punch can be used to advantage to secure a neat fit around the pivot, or wrist pin, free from lost motion.

Place the bushed member in a vertical position on a circular piece, the diameter of which corresponds to the outer diameter of the bushing, and on the upper side place a similar piece. Rest these on a solid support, as an anvil, and drive with a substantial hammer. This is continued until the bushing closes up the desired amount, over the full length of the bearing. Ream out the excess at the extreme ends, with a reamer of the correct size. Wrist-pin bearings, gear bushings, steering-pivot connections, and almost any bronze bushing will respond to this treatment.

The treatment of bushings by cleaning the center with acid and pouring molten solder into them, is also a simple means of accomplishing a snug fit in the minimum of time. The bulk of the solder is allowed to blow out before hardening, leaving only a thin film. The inner surface of the bushing is trimmed to remove the excess, and the pivot or bolt is driven through. This method is not permanent, and the process must be repeated occasionally to keep the pivot tight. Do not attempt this at the wrist pin, as the temperature of the piston is too high for a tinned bearing, or, in fact, in any other bearing which may become excessively hot.

### To Divide a Mixed Number by Two

In many lines of work, and particularly in drafting, it is very handy to know a quick way of halving a quantity which is expressed by an odd number followed by a fraction. It is chiefly with large numbers that the advantage of this method is shown, but 9⅝ will serve as an example.

Divide the integral number (in this case 9) by 2, and neglect the remainder (in this case, 1). This gives 4, which is written down as the integral number in the result.

Add together the numerator and denominator (in this case, 5 and 8, making 13) and write it down as the numerator in the result. Multiply the denominator, 8, by 2, and the product is 16. Use this as the denominator in the result, and 4 13/16 is obtained as the final figure.

Little time is saved when the number is a small one, but speed is increased with a minimum chance of error when this method is applied in the case of a large number.—H. A. Pearson, East Chicago, Ind.

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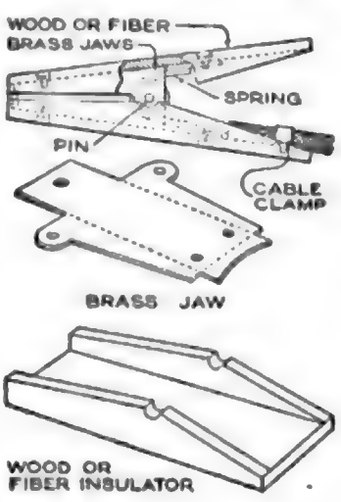
### Safety Insulated Test Clip

In testing electrical apparatus, it is always desirable to have some means of quickly connecting the apparatus to the electrical supply. Most of such appliances are unprotected against short-circuiting when they come together or against some other object, sometimes causing dangerous shocks to the operator. Others are covered with soft rubber; these, if used around machines and exposed to oil, are often more dangerous than if not covered at all, as the rubber soon is affected by the oil, and cracks or rots, allowing the hand to come in contact with the bare metal.



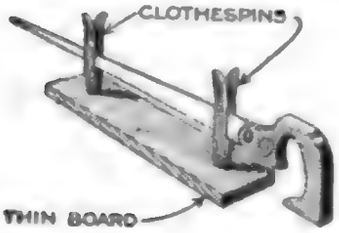

To overcome some of these difficulties and eliminate danger in the test rooms of a large electrical factory, several types of connectors, or clips, were designed and tried out. The upper sketch shows one which has been much used on account of its

simple and rugged construction; it is entirely insulated by a durable covering, which protects the operator from shocks, and prevents "shorts" if clips carrying different potentials come together.

The clip consists of an outside covering of wood or fiber, fastened with six small machine screws to the brass jaws. The screws are countersunk into the covering, and are covered with insulating pitch or compound. The central sketch shows the pattern for the brass jaws, which are made from heavy sheet-brass punchings. They are attached to a pin and a steel coil spring, which should be rather stiff. A brass cable clamp holds the cable mechanically to the clip, and the electrical connection is made by soldering the wires directly to the jaws of sheet brass.

The lower sketch shows the insulating covering, which should be well shellacked or varnished. A good set of these clips will soon become a valued time-saver wherever electrical testing is done. —Philip G. Bernholz, E. Orange, N. J.

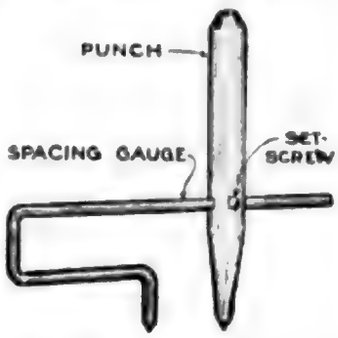
## Saw Rack Made from Clothespins




A saw rack for the workbench is easily made by fitting ordinary clothespins into suitable holes in a strip of board.

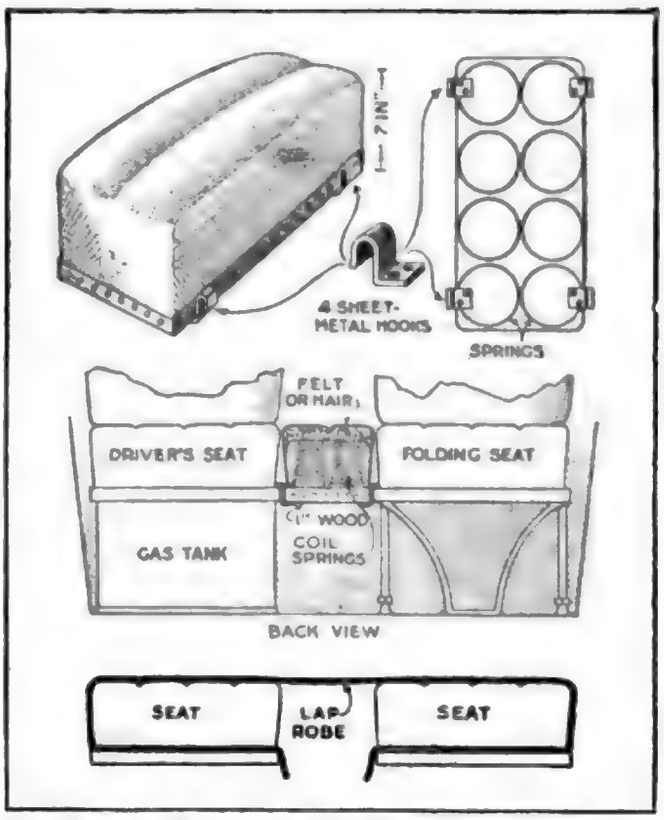
## Center Punch with Spacing Device

When a number of prick-punch marks are to be made for a row of holes to be spaced equidistant from each other, much time can be saved by the use of a punch provided with a gauge, as shown. The gauge is first set accurately by means of a scale, and the first mark is punched in the usual way. The point of the gauge is then placed in it, and the second mark made, and so on. If a large number of holes are to be made, and great accuracy is desired, it is advisable to measure the distance from the first punch mark to the eleventh one, as any error in setting the gauge can then be seen magnified ten times.—W. C. Reichard, Syracuse, N. Y.




## Extra Front Seat for Closed Car

In a sedan, where it is often desired to carry a sixth passenger, the addition of a detachable, upholstered seat to fill




**Two Types of Detachable Extra Front Seats are Illustrated, Which will be Found Useful in Certain Kinds of Automobiles**

the gap between the front seats is both convenient and practical. Such a seat may be 6 in. wide by 14 in. long. The upholstering is about 7 in. deep. The base of the seat is of wood, about ½ in. thick. On this is placed either five or six coil springs, such as are used in chair construction. A felt or hair pad is fastened over the top. The detachable seat is then covered with the same material used for the interior coverings. The bottom of the seat is fitted with four metal hooks to catch over the edges of the adjacent seats.

In an emergency, the sixth passenger can also be accommodated by means of a robe which is stretched across the adjoining seats and carried under the extreme edges. With the two end passengers seated, he will find the hammock-like robe quite comfortable for riding.

¶When winding water pipe with paper to prevent freezing, the insulation is considerably improved if pieces of rope are first wound around the pipe, and the paper then placed outside the rope. This gives an air space between the pipe and the paper.

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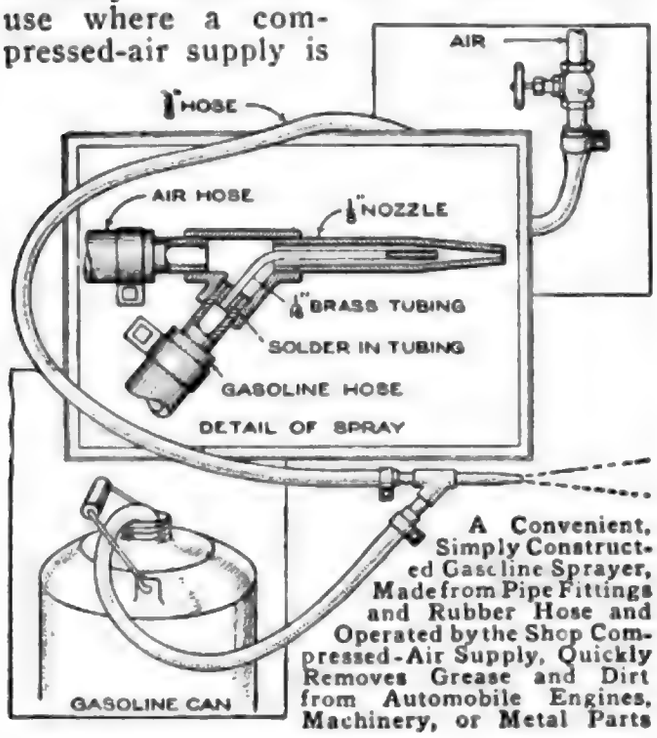
### Gasoline Sprayer Cleans Metal Parts

Grease can be quickly removed from machinery, or metal parts, by means of a pressure gasoline spray. Such a spray is easily constructed and convenient for use where a compressed-air supply is




A Convenient, Simply Constructed Gasoline Sprayer, Made from Pipe Fittings and Rubber Hose and Operated by the Shop Compressed-Air Supply, Quickly Removes Grease and Dirt from Automobile Engines, Machinery, or Metal Parts

available. A ⅛-in., 45° tee is fitted with 1½-in. lengths of pipe in the side opening and in one of the end openings. To these are clamped lengths of ⅜-in. rubber hose, the one at the end opening connecting with the air supply, and the other long enough to reach to the bottom of a gasoline can while the nozzle of the spray is being held at working height.

The gasoline feed is made by soldering a 2¾-in. length of 1/16-in. brass tubing into the end of the pipe leading to the gasoline supply. This brass tubing is then bent to extend through the remaining end opening at exactly the center line of both end openings.

A 3-in. length of ⅛-in. pipe, forged down at one end, serves as a nozzle. This is screwed into the end opening over the brass tubing.

When compressed air is admitted to the nozzle, a vacuum is created in the brass tubing which draws gasoline from the can. This gasoline is then blown from the nozzle in a fine spray, which quickly removes grease from metal parts. —C. C. Spreen, Detroit, Mich.

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Several sheets of paper may be fastened together by punching small holes in the upper edge, pushing discharged cartridge shells of small caliber through them, and clinching with a hammer.

### Scrap Iron Repairs Trace

When a wagon trace breaks, a very strong repair can be made at the cost of a few cents by joining the broken ends together with a piece of scrap iron, of the kind that can be found on most scrap heaps. Cut a piece about 4 in. long; drill four holes in it, large enough to admit ¼-in. rivets, and punch corresponding holes in the broken ends of the trace, two in each end. Push the iron into the trace between the stitches, so that it is completely hidden when the broken ends are drawn together. Pass rivets through the holes in the leather and the iron, flatten the ends, and the work is done. It is good policy to splice a trace in this way when it begins to show weakness, without waiting for it to break. The job can also be done by taking out the stitches along one edge, inserting the iron, riveting, and stitching the edge again.—H. F. Grinstead, Columbia, Mo.

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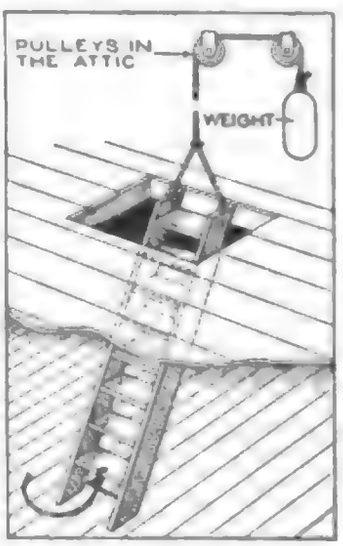
### Making a Disappearing Stairway for the Attic

Much attic storage space is left unused because there is no stairway to reach it. The only entrance to such attics is a square trapdoor, perhaps in the bathroom or in a clothes closet where a stairway would be in the way, besides being expensive to build.




To make a disappearing stairway for such an attic, two 1 by 8-in. boards may be fitted with steps, as shown. Put a staple in the top of each side section, and attach a piece of rope. This rope should run through a pulley fastened under the ridge pole of the roof. From here it runs through another pulley near a side wall, and the end is weighted with enough iron window weights, or other metal, to equal the weight of the ladder.

When the ladder is not in use, a very slight effort will shove it up through the trapdoor, and out of sight. A slight pull on a short piece of rope tied to the lower end brings it down when wanted.

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### Electric Fan Displays Sign

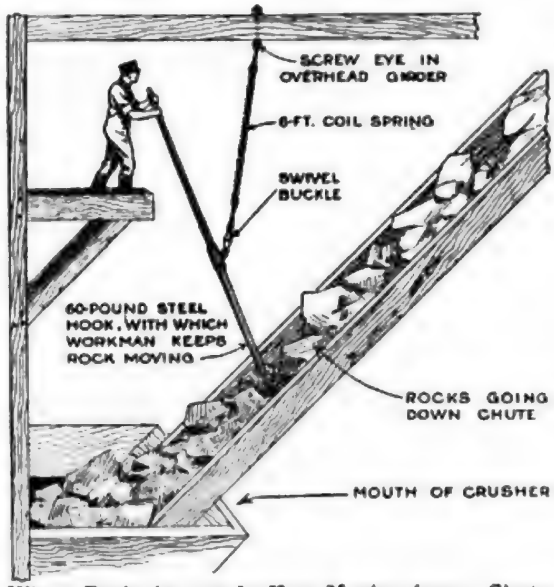
A striking window display advertisement may be arranged with an electric fan, four pieces of sewing thread, 3 ft. long, and a piece of cardboard, 3 by 6 in. in size. The advertisement is printed on the cardboard, and a string is then tied to each corner of the card, and to the wire guard of the fan at equal distances around its circumference. Hold the cardboard at the ends of the strings, and turn on the fan. When the motor attains its maximum speed, release the card. It will move about with erratic jumps and twists, but the advertisement will always be readable.— H. E. Pilkington, Chester, Pennsylvania.

### Bracket for Draftsman's Lamp

The photograph shows a convenient method by which a draftsman adjusted the position of a lamp and shade over a drawing board. An ordinary folding telephone bracket was mounted on the wall, near the left-hand edge of the board, and a small block of wood, about 1½ in. square and 2 in. long, was fastened with wood screws to the end of the bracket. A hole was then bored in the front face of the block, to admit the central arm of a pipe tee; and a reducer was screwed into the lower arm of the tee, so that it hung in a vertical position and connected the tee with an ordinary key socket, the wider member of the reducer entering the tee, while the narrower one passed into the socket. The lamp cord was led through the loops in the bracket and down into the tee, from which it passed through the adapter into the socket. This arrangement made it possible to illuminate any part of the board at will, or to fold the bracket back out of the way when not needed.—E. L. Durgin, Auburn, Me.

### Chute Hooks Supported on Springs

In nearly all mines and quarries where coarse ore and rock is sent through chutes to the crushers, it falls to the lot of several workmen to be stationed along the chutes to keep the stuff moving. These workmen are usually supplied with long steel hooks, with which they dislodge the rocks when they jam.



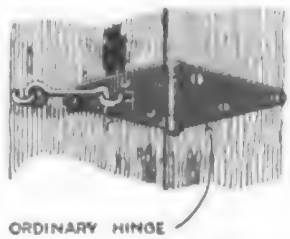

Where Rocks have to be Kept Moving down a Chute, the Hook Required may be Improved by Adding a Support

The hooks used in this work usually weigh about 60 lb. Thus the work of lifting this load all day is even greater than the amount of energy expended in moving the rocks. All this has been eliminated, in one quarry, by the use of spring-supported hooks, as shown in the accompanying sketch.

With the spring-supported hooks, the men are not only able to work faster, but they accomplish the same amount of work with far less effort. The spring-supporting method is primarily a man saver. Workers in other mines and quarries would do well to adopt the idea, which is decidedly a profit-maker for both the employer and his workmen.

### Strap Hinge Used as Hasp

When a hinge hasp for a barn door was badly needed, and was not at hand, a very good substitute was made from an ordinary strap hinge. One half of the hinge was attached by screws, as usual, to the door casing, and the free half was cut out by means of a drill and cold chisel, to take the staple. The free end of the hinge was turned back slightly for a grip.

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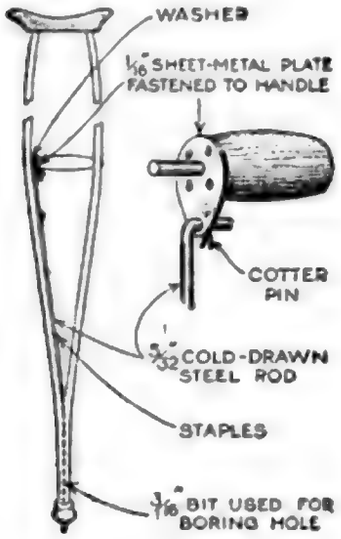
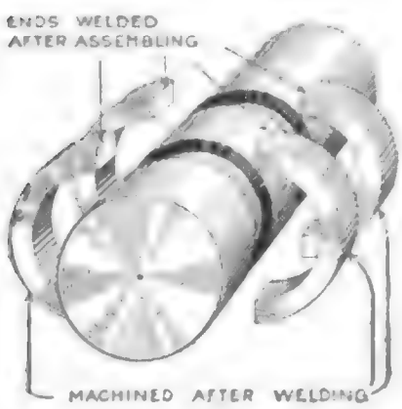
### A Crutch Safe to Use on Ice

An ordinary crutch can be made safe to use on ice by boring it through the center, and running a rod with a sharp end down from a lever on the handle, so that by turning the handle the pointed end is made to project from the end of the rubber tip. Use a 5/16-in. bit for boring the hole, and a 5/32-in. cold-drawn steel wire for the rod. Drive three or more staples loosely over the rod, to keep it from buckling, without preventing free sliding. File off one end of the long rivet which runs through the handle, remove both rivet and handle, and saw about 1/4 in. off the end of the latter. Make a plate, as shown in the drawing, of 1/16-in. sheet metal, and fasten it to the end of the handle with four screws. Put the handle back in place, inserting a washer, about 3/16 in. thick, to keep the plate away from the side of the crutch. Bend the end of the 5/32-in. rod, and fasten it with a cotter pin. Rivet the handle so that it will turn easily.

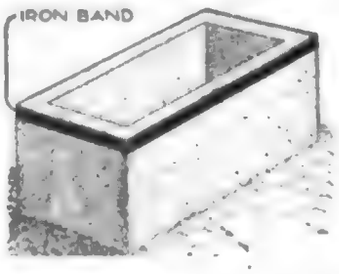



### Building Up a Worn Shaft by Welding

A shaft in a machine shop became badly worn at the ends, where it rested on bearings. The defect took the form of deep grooves, two at each end, caused by friction between the shaft and the edges of the oil holes; the latter had scored the surface of the shaft as it traveled past them, and had eventually worn grooves in the metal. It was decided to make repairs, but it was not considered practical to fill the cavities by welding new metal to the shaft, as the latter would probably be sprung by heating. The spaces were therefore filled with rings, cut in halves, and welded together again after they had been placed in position. The rings were simply disks with holes bored in them, corresponding to the diameter of the grooves; and after the two halves of each had been welded together in the grooves, they were machined until their outer diameter corresponded to that of the shaft. As the grooves were at the ends of the shaft, the weakness caused by the loss of metal was not a serious matter; the function of the loose rings was merely to finish out the bearing surface.



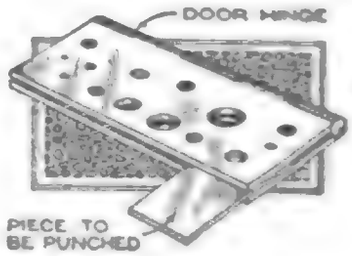

### Protecting Edges of Concrete Tanks




A band of 3/16 by 2-in. strap iron, bent to shape, bolted, and inserted in the forms, will protect the edges of a concrete tank.

### Hinge Forms Die for Use with Hand Punch

Punching holes in light metal by hand is a very useful process, and saves much time which would otherwise be spent in drilling. Moreover, it is possible to punch a hole even through spring steel, so hard that it could not be drilled. The requisite tools are a heavy hammer, a nail set with very slight taper or no taper at all, and some kind of die and stripper. The last two items are well taken care of in the method illustrated. An ordinary butt door hinge is drilled with various sizes of holes, and a punch or nail set is provided to fit each one. The work is then inserted between the leaves of the hinge, the punch placed in the hole, and a good heavy blow from the hammer will produce a clean, fairly accurate hole in the work. The method is of special value to those who use pieces of clock spring, or of spring brass or bronze, in the construction of various small devices.—W. C. Loy, Rochester, Indiana.

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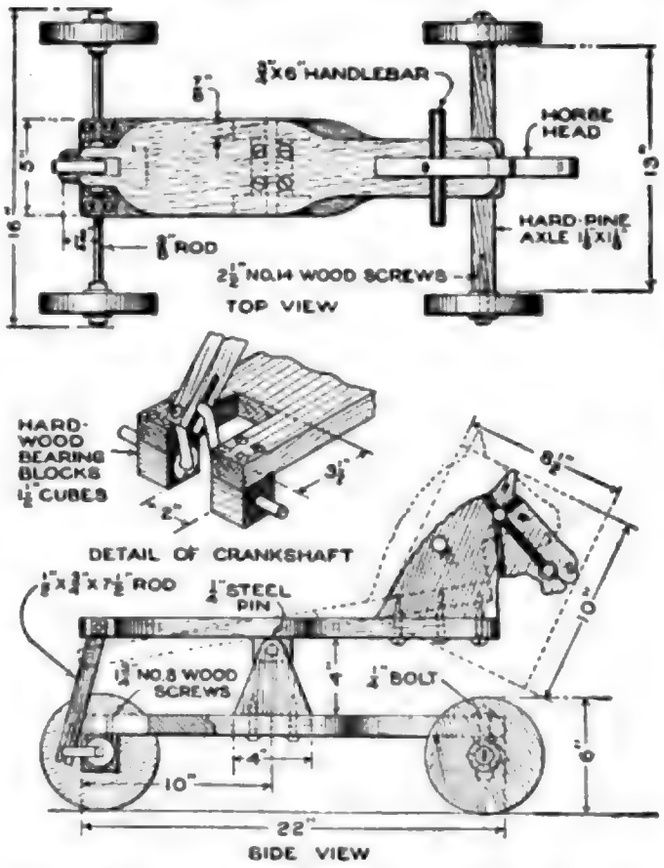
# A Trotting Hobbyhorse

By F. D. BURKE

THE toy that in any way resembles a horse is usually the first one to win the affections of a child. A little trotting horse that will provide an abundance of healthful exercise and an endless source of amusement, can be constructed in a few hours at an expense of less than $1 for material.

For the principal wood parts, procure two pieces of poplar, or clear pine, dressed to ⅝ or ¾ in. thick. One piece should be 6 in. wide and 6 ft. long, the other 9 by 12 in. On the short piece, the head of a horse should be outlined with a pencil; and on the 6-ft. board are outlined the four wheels, the body board, the baseboard, and two triangular blocks on which the horse rocks. The board is then taken to the nearest woodworking shop and the various parts cut out on a band saw. The work, if done this way, will take but a few minutes, whereas, if done by hand, it will require two hours or more, and the finished parts will not look so well.




With a Steed Like This, the Young Jockey can Gallop All around the Back Yard. The Speed Attainable Is Not High Enough to Cause Any Anxiety

The various wood parts should next be given one or two coats of bright paint. An attractive color scheme is to paint the entire toy, with the exception of the wheels, a bright red, the wheels being painted a bright green. The mane, bridle, eyes, nostrils, etc., are afterward painted black. While these parts are drying, attention can be given to the axles. The rear axle should be bent to the form of a single-throw crank, of the dimensions given in the detail. The material, ⅜-in. bessemer rod, can be purchased in 4-ft. lengths in hardware stores. A piece 20 or 21 in. long should be used. Right-angle bends can be made in this material without the use of heat, the only tools required being a vise and a fairly heavy hammer. After bending, the axle should be cut to the dimensions given, and the ends threaded for a distance of 1½ in.

The finished axle is mounted as follows: Two hardwood blocks of the size indicated are drilled with ⅜-in. holes, and, preceded by two tight-fitting washers, are slipped over the ends of the axle. The blocks are attached to the baseboard with wood screws, as shown in the lower view. The washers are then pushed up against the blocks and held there by one or two deep punch marks in the axle. This will serve to hold the crank properly centered. The rear wheels are held in place by nuts and washers, as shown in the upper view, the nuts being drawn up tightly and held in place by punch or chisel marks in the axle.

The front axle, a piece of hard pine of the dimensions given, is pivoted at



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the front end of the baseboard. The wheels are attached to the axle by long stout screws. The two triangular blocks on which the horse rocks are similarly attached to the baseboard, at the points indicated. A block that will fit snugly between these triangular pieces is screwed to the underside of the rocking board. The latter is then mounted on a long pin, as shown.

For the handlebar, a 6-in. piece of ¾-in. dowel should be driven through a hole in the head, at the point indicated, and fastened with a light nail.

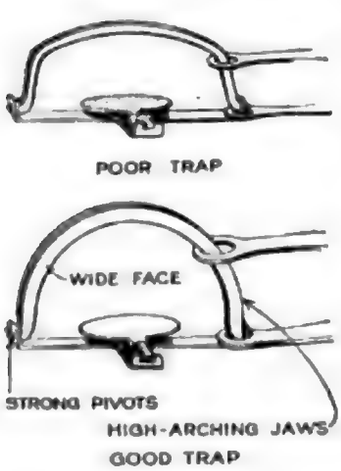
The connecting rod is made in the following manner: A ⅜-in. hole is drilled near one end in a piece of hard wood of the dimensions given. The piece is then slotted at this end, as shown. With a little care, the piece can be sprung over the crankpin of the rear axle. A screw in the end of the piece will serve to hold it in place. To arrive at the correct length between holes for the connecting rod, place all parts of the toy in the position shown in the bottom view. The proper place for the hole in the upper end of the connecting rod can then be located and the hole drilled. This end of the connecting rod is held in place by means of a ¼-in. bolt.

The horse, as described, is suitable for a child from three to five years of age. In riding the toy, the child sits on the horse just over the point where it is connected to the base, his feet resting on the front axle. He grasps the handlebar, working it up and down, thus giving the horse a rocking motion, and propelling it at the same time. Steering is done with the feet.

## How to Tell a Good Trap

The trapper who buys steel traps at their present high cost, and catches furs that are often worth small fortunes, should select a trap that is highly efficient.

The best kind of a steel trap arches up, when its jaws are closed, in an almost perfect half circle, while traps that are poorly built have low-gripping jaws. The high-catching trap holds the animal high up on the leg, so that it cannot free itself by struggling, while the low-gripping jaws may only pinch a toe or the foot. Be sure, also, to select a trap with wide-faced jaws. This provides against the trap cutting off, with its sharp edges, the delicate leg of a valuable mink. Jaws that come together with thin rounding faces are sure to allow the animal to twist about, and its foot to become severed. Some traps are built with a jaw face of ½ in. to ¾ in., while others carry extra grips below the jaws.



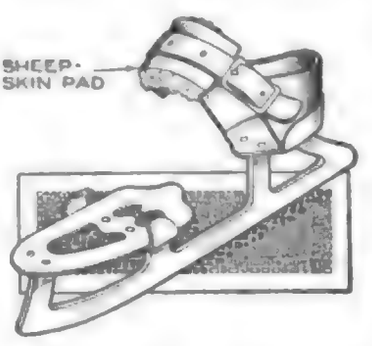

Look well at the pivots where the jaws hinge onto the frame of the trap. These should be strong, and work smoothly in their bearings when the jaws are opened. Buy only a trap the spring of which has been "water-tested" by the maker, and is so warranted by him. Another matter to look into is the length of chain provided with the trap, since many poorly built traps have chains from 6 in. to 1 ft. too short.—F. E. Brimmer, Syracuse, N. Y.

## Face Protector for the Motorcyclist

A motorcyclist who had to do a great deal of riding during cold weather found that the best protection for his face was afforded by a piece of an automobile curtain. This was looped around and pinned, or tied, behind his head, the celluloid window being in front of his eyes. By rubbing a little alcohol on the celluloid to make the rain or snow run off freely, the protector did good service on winter days.

## Soft Pads on the Skate Strap

A skate strap usually cuts or rubs where it crosses over the arch of the instep. This painful fault may be remedied by fitting a soft pad to the strap. Such a pad is made by riveting a double thickness of sheepskin, about 3 by 4 in. in size, to the strap. This, when so padded, may be pulled tight, without causing discomfort to the skater, yet holding the skate perfectly.—C. A. Black, Hightstown, N. J.

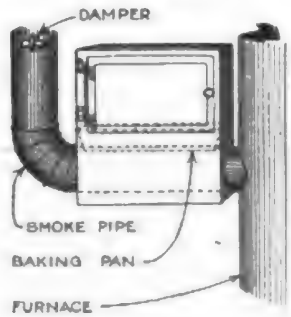


### Rubber Tubing for Radiator Leaks

When a leak in an automobile radiator of the tubular type is too large to be soldered, a satisfactory repair job can be done with rubber tubing, and pieces of the right size can generally be bought in drug stores. It is more practical to use this method than to close the leaking tubes with pliers, as the latter practice makes it difficult to drain the radiator. First, cut about 2 in. from the radiator tube, removing an equal portion on each side of the leak; then slip a piece of rubber tubing, about 6 in. long, over the ends, and secure it by winding thin wire around it. Two or three turns of the wire are enough to hold the rubber, after which the ends can be twisted together and the surplus pieces removed. Be careful not to leave rough edges where the leaky portion of the tube is cut away; a clean cut will make the repair much more lasting.—Wesley S. Malloy, Whitefish, Mont.

### Warming Oven on Furnace

The heat of a furnace smoke pipe may be utilized to keep a simple warming oven at the proper temperature. For the oven itself, almost any kind of metal shipping case, discarded metal oven, or specially made thin metal box may be used. The front is fitted with a hinged door which has a simple catch. A bake pan is riveted to the inside of the oven, just above the furnace pipe, for which purpose holes have been cut in the sides of the oven. One important detail is that the damper must not be placed between the oven and the furnace, but between the oven and the chimney. This insures the oven being supplied with heat whenever there is a fire in the furnace.—M. E. Duggan, Kenosha, Wis.




### A Child's Play Window

When the weather turns cold, and a child misses his outdoor play, he can get a great deal of consolation out of a window arranged as shown in the photograph. Under the window is built a spacious shelf, just high enough to be handy for the child when sitting in the chair. In the center of the shelf is a door, which, when swung upward, opens up a cabinet where there is plenty of room for toys. When the toys are brought out, the door is swung down again and forms part of the shelf, on which many houses and railway systems can be laid out. Not the least of the advantages of the play window is that it is likely to diminish the amount of floor space which is usually found covered with toys.—F. E. Mashburn, Chicago, Ill.

**The Broad Shelf, Built at a Convenient Height under a Bay Window, with a Space Below for Keeping Toys, will Keep Small Hands Busy during Many a Rainy Day**

### Wainscoting Made from Matting

Torn or marred wall paper may be covered by a very attractive wainscoting made from straw floor matting, of a pattern and color that harmonizes with the remainder of the wall. The matting is fastened to the wall by means of molding at the bottom and top edges, and by panels every four feet. Quarter-round molding is best for the bottom, but half-round molding, or strips of thin board 4 in. wide, should be used for the top and for the panels. If the matting is stretched tightly, the resulting appearance will be a decided improvement over the scratched or soiled wall paper.—H. F. Grinstead, Columbia, Mo.

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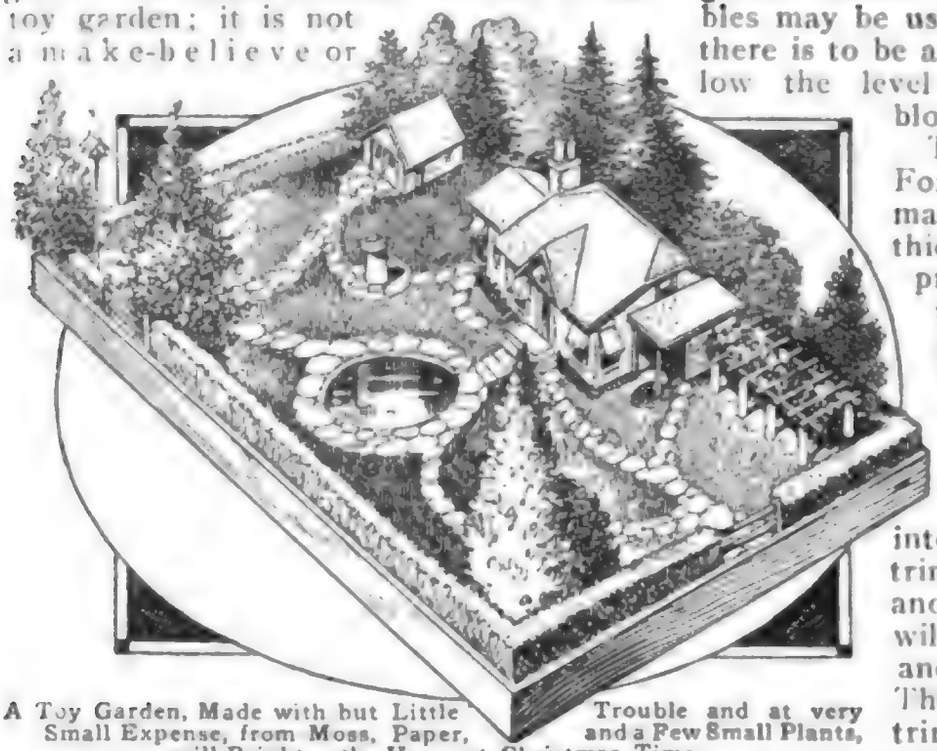
### Toy Garden of Real Plants

An amusing and unusual Christmas gift for the small brother or sister is this toy garden; it is not a make-believe or a paper affair, but one in which things really grow, just as they do outdoors.



A Toy Garden, Made with but Little Trouble and at very Small Expense, from Moss, Paper, and a Few Small Plants, will Brighten the Home at Christmas Time

The garden should be made in a shallow wooden box of any width, but 3 or 4 in. deep, and long enough to fit the window—36 by 24 in. is a good size. A few pebbles, or a little sphagnum moss, obtainable from any florist, should be put in the bottom for drainage. Then the box should be filled to within ½ in. of the top with soil that is chiefly sand. A good mixture is one part black soil and two or three parts sand.

The house to which this garden belongs may be about the size of a wooden starch box; a small doll's house may be moved from the playroom to this more interesting site, or some country house may be reproduced by means of thin wood, or cardboard, glue, and water colors. The drives and paths may be laid out as the builder pleases. Fine gravel makes a good roadbed. Flat pebbles may be used as flags for a walk. If there is to be a sunken garden a little below the level of the house, building blocks make excellent steps.

Then comes the planting. For the lawn, mustard seed may be used, sown quite thickly, covered lightly, pressed down, and watered thoroughly. It will grow up in about a week. Dwarf sweet alyssum, sown as in a garden, makes a good shrub. For hedges, use bushy tips of arbor vitæ, stuck into the sand. These may be trimmed square with scissors, and, if watered occasionally, will keep green all winter, and often even take root. The arbor-vitæ tips untrimmed make attractive shrubs. Privet cuttings and any other evergreen seedlings may be used for trees. They should be planted before sowing the lawn. Very small potted bulbs, such as the crocus and grape hyacinth, are pretty in the toy garden.

The garden ornament may be varied. Building blocks sunk in the sand make excellent columns for a pergola, and a vine of English ivy from a pot can be made to shade it. The little garden may be adorned by the addition of a sundial, modeled from clay, with white pebbles, as cobblestones, at its base. For a pool, the saucer of a flowerpot may be sunk in the lawn in the center of the garden. A little time spent in planning and executing the design for the garden adds to the appearance of the gift.

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### Making Sticks of Charcoal

Charcoal sticks, such as used for drawing purposes, can be made at home. Cut sticks of wood to the size desired for the sticks of charcoal. Wrap a piece of wire around each stick, leaving a long end on the wire for a handle. Melt a quantity of lead or babbitt in a tin can, just deep enough to cover the stick. Plunge the wood into the molten metal quickly, to avoid bubbling. Examine it from time to time, as it may become too crumbly to use if left too long.

### Silencing the Typewriter

The unpleasant noise made by a typewriter can be largely silenced by interposing vibration absorbers between the machine and the floor. Linoleum of some plain color may be used to cover the table top. This is compo ed mainly of cork, which does not transmit readily the vibrations that produce the noise. Putting rubber tips on the table legs completes the remedy, which will result in almost silent operation of the machine. —Jack Solon, Natchez, Miss.

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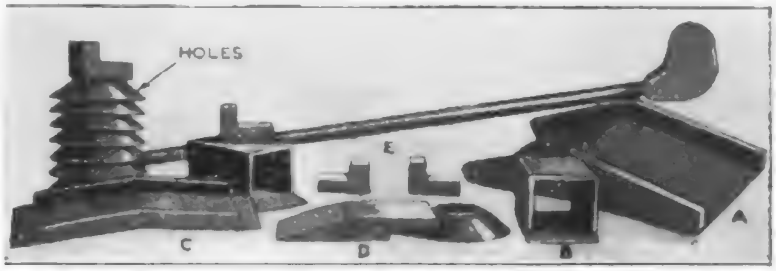
## Golf for the Winter Evenings

When the wind blows cold outside, in fact too cold for comfort, stay at home and play golf.

The indoor course consists of nine holes, each a gray-iron casting, made from a wooden pattern of similar shape. All these holes may be made of wood, but the other method is less laborious. Then as to the hazards: The hilly approach to the first hole, shown at A in the photograph, makes a good start for the game, while the tunnel B, for the third hole, is slightly more difficult. The shaped piece marked C is the approach to the fifth hole; it changes somewhat the regular style of playing, and adds to the interest and skill of the game. Another tunnel like B is adapted to the seventh hole, and a hard finish is handed the player by the narrow grade approach D, to the ninth. The diagram shows how the course is laid out, with the spacing blocks E placed in front of the other holes, not already mentioned.




The Holes, the Hazards, and the Club for an Indoor Golf Course: These Are Gray-Iron Castings, with the Exception of the Club, Which Is of Pine Wood

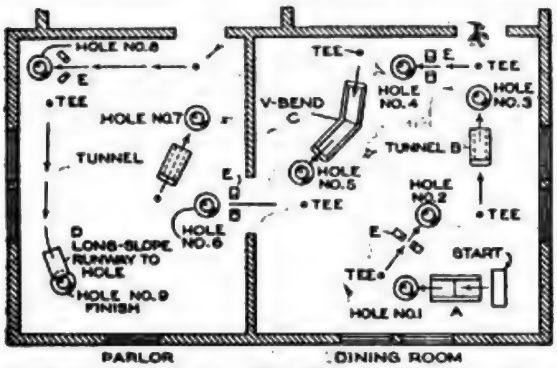



Diagram of the Course: Two Rooms with a Door Connecting will Give Plenty of Room for the Nine Holes

As will be noted, a dining room and parlor serve for the "links."

The complete equipment, except the iron pieces above mentioned, is made of ordinary pine wood at very slight cost.—J. H. Moore. Toronto.

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## Power Sled Made from Motorcycle

A Nebraska boy wanted to take his girl out for a sleigh ride, but had no horse. The accompanying photo shows how he solved the problem. This motorcycle sled is steered by turning the front runners by means of rods running back to the wheel. The throttle, spark, and clutch levers are all within convenient reach of the operator; the "clutch" consists of a lever arrangement for lifting the drive-wheel from the ground. A chain on the wheel affords traction, and it is possible to make 10 or 15 miles per hour where the road is broken. Of course, where a deep drift is encountered, the driver must resort to a shovel.

The Motorcycle Rider Who Builds a Sled of This Type can Mount His Machine in It While the Ground Is Snow-Covered, and can Readily Remove It and Remount the Front Wheel and Handlebars at the End of the Sledding Season

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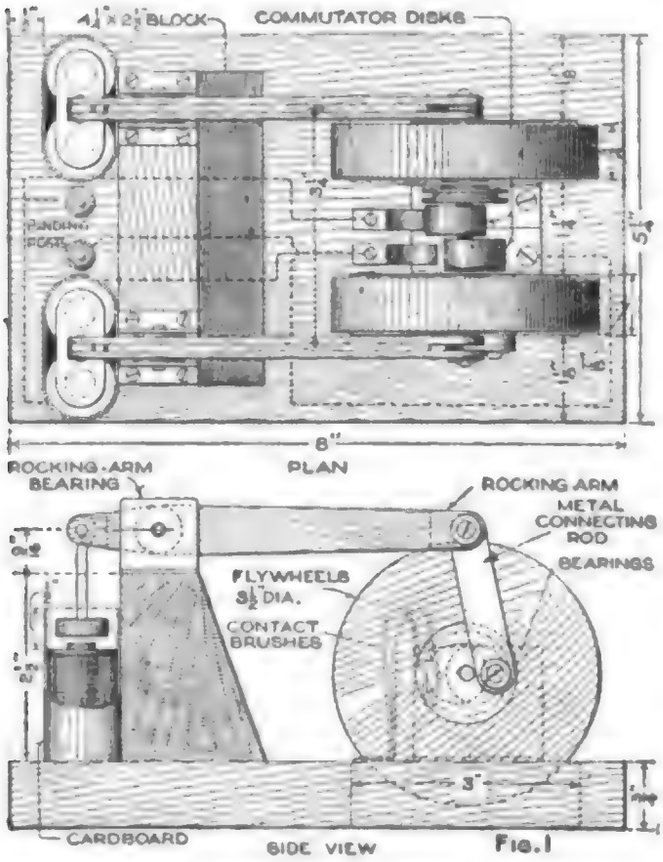
# A Model "Twin" Electric Engine

By L. B. ROBBINS

THE twin-cylinder electric engine is of interest to the toy maker chiefly on the ground of its businesslike appearance, its smooth-running qualities, and above all, the fact that it is practically self-starting. The one here described can be made without a lathe, using the ordinary hand tools, if some round pieces of wood and metal can be found. The engine is powerful enough to run many kinds of toy machines.

As shown in the assembly drawing, Fig. 1, the engine is built on a base, or bed-




**The Electric Engine Is Very Similar in Its Working to a Two-Cylinder Single-Acting Steam or Gas Engine**

plate, consisting of a wooden block, with two slots cut in it to take the two upright wheels. After they are cut to these dimensions, two double-spool electromagnets from old electric bells are mounted on the block in the position shown. Arrange a piece of cardboard around each pair of spools, so as to inclose them and project slightly above them. The rocking arm is made up of three thicknesses of cigar-box wood, as shown at the top of Fig. 2. The dimensions given provide a leverage of four to one, so that the crank of the engine will have four times as much motion as the armatures of the electromagnets. The sections of the arm are glued together, heavy weights being set upon it until the glue has hardened. The middle section is made shorter than the outer ones, to provide forks at the end to take the armature rod at one end, and the connection rod at the other end. The pivot hole is drilled straight through all three sections.

The two flywheels, ¾ in. thick, are cut out of some heavy wood, like oak or ash; have a ⅛-in. hole drilled through the exact center of each, and should be balanced by removing some wood with a knife on the heavy side, until they will run true without wabbling. Smooth off the faces with fine sandpaper, and varnish with shellac. The large bearing block can be cut out of almost any kind of wood, and is made wider at the bottom, so as to give stiffness. It is fastened solidly to the base with glue and screws. The two rocking-arm bearings, detailed in Fig. 2, are screwed on top of this block. Set the halves of each bearing so that the center of the space between them will come in line with the center of the corresponding magnet.

The two armatures can be sawed out of some soft scrap iron. It is important that the iron should be soft; this can be tested by hammering a small piece and noting whether the material is readily nicked by the hammer blows. The rods from which the armatures are hung are ordinary nails, with the points filed off and the ends bent to form a loop. The nails should be a drive fit in the armature iron; if the smooth part of the nail slides a little loosely in the hole which is drilled in the armature, the part near the head will probably come sufficiently tight, owing to the clamp marks in it.

The connecting rod should be made of quite stiff brass, but the two brushes must be made of very thin spring brass, or bronze, so that they will not introduce any great friction. The main bearing is made like the rocking-arm bearing, from two pieces of brass, bent to a right angle. The two halves of the commutator can be sawed out of ¾-in. round brass rod. In each of them is drilled a 3/16-in. hole, offset ⅛ in. from the center of the disk. The main shaft is made of a piece of steel rod, 3/16 in. in diameter, and carries the commutator, flywheels, and pulley. Assemble them, in the order shown, upon the shaft, also placing the two halves of the bearing in position. The commutator disks are soldered to the shaft so that their widest sides come exactly opposite. The pulley



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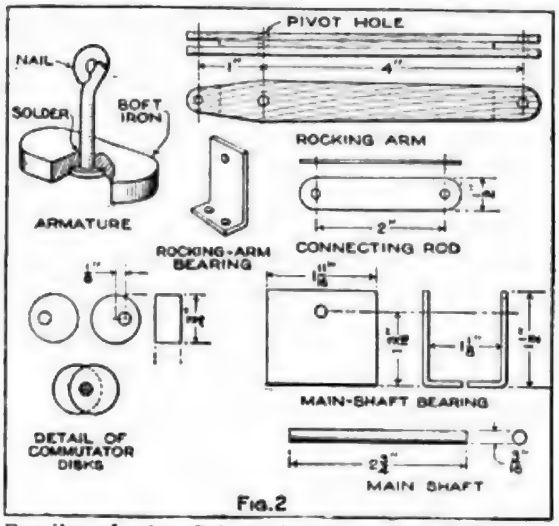
can be made of brass, or of hard wood if more convenient. When the commutator, bearings, and pulley are properly placed on the shaft, adjust the flywheels on each end of the shaft, driving them on to make a snug fit. Place washers between them and the bearings. When fully assembled and adjusted to run free and true, fasten the bearing halves in position upon the base, so that the shaft will still run freely. The connecting rod is attached to the rocking arm and the flywheel by small brass screws, working freely where the motion occurs. Those in the flywheel should be set ⅜ in. from the center of the shaft. When the armatures are assembled at the other end of the rocking arms, the armature should work up and down as the shaft revolves, but should never touch the magnet cores. The length of the armature rods should be made so that this condition is just secured, or some kind of shims may be placed under the magnets to make this adjustment, if found necessary. The cardboard around the magnets prevents the armatures from swinging outward, and also gives the appearance of engine cylinders.

The contact brushes should then be mounted and adjusted so that each magnet will be energized just as the crank comes to the position where its pull may be effective. Each brush should make contact for just slightly less than half of the revolution of the shaft, so that unless the engine happens to stop just on "dead center," it will be self-starting. In this respect, it is analogous to a steam engine. The wiring diagram is embodied in the assembly view, Fig. 1; the dotted lines indicate wires, which are laid permanently in grooves on the bottom of the block, and are brought up through it to the bearings, or "ground," the brushes, and the two binding posts. The terminals of the battery are, of course, connected to the two binding posts, and the engine is ready to run. The voltage and current it will take, as well as the power and speed it will develop, will, of course, depend on the electromagnets used. It will be well to set rubber buttons on the underside of the base to take up some of the vibration.

Caution should be observed that screws are not allowed to become loose at high speed, as the engine may reach a speed which might make this condition dangerous.



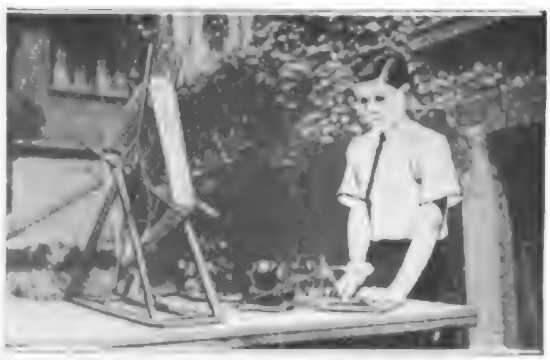

Details of the Principal Parts of the Engine: These may All be Made with Familiar Tools, from Common Materials

### Film for Kindling Fire

Campers will find that bits of celluloid film—which may be secured from motion-picture machine operators for the asking—will greatly facilitate the lighting of a fire, especially when the wood is slightly damp. The film lights quickly, and burns with a fierce heat.—Jack L. Dickler, New York, N. Y.

### Electric Motor Winds Woolen Yarn

For winding skeins of wool into balls, a boy who owns a toy building set used some of the metal parts of this outfit. He made a large steel-frame wheel, on which the skein of wool was placed, and mounted a rod with a pulley for receiving the wool. By means of a belt the pulley is connected to a small electric motor, the operator guiding the wool as it is wound up. The motor is driven by the current from a transformer connected to the house-lighting mains.



A Toy Building Set Supplies Parts for an Outfit Used by a Boy to Wind Yarn into Balls

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### Snow Shoes Made from Tin Can

In a western mining camp, a recent development is metal snow shoes. These are made of tin, cut out of oilcans. A piece of stiffer sheet metal is run lengthwise, along the center of the bottom of each shoe, turning up at the front. The two pieces of sheet metal are held together by several rows of clinched nails, and provision is made for attaching the shoes to the foot by adjustable leather straps. The length of each shoe is 3 ft. 4 in., and the greatest width 14 in. The weight is 4½ lb. Such shoes have been found to support successfully a 6-ft. man, weighing 170 lb., making a depression of from 3 to 6 in. in a 3-ft. depth of snow. No trouble is encountered from slipping.—Allen P. Child, Kansas City, Mo.

### Vase Made from Coconut

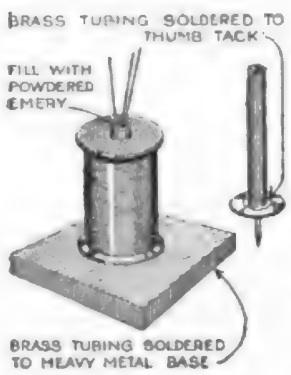
A pretty vase can be easily made from a coconut shell. First, saw the coconut in two, crosswise. Saw the end from one of the halves. With a file, remove the rough surface of the shell, then sandpaper it, and finally polish it with a cloth. Various designs may be carved upon the surface, one of the simplest being that shown in the picture. It is made with the aid of a compass. Copper or brass strips may be used for decoration, and also to hold the two sections of the vase together, or the sections may be glued. The shell takes an excellent polish, resembling mahogany.

### A Chemical Fire Fountain

A miniature fireworks display can be given at a Christmas party by using a few inexpensive chemicals. Pour 6 oz. of water into an earthenware bowl (do not use a metal one). Add 1 oz. of sulphuric acid, but, to avoid danger, pour this carefully into the water, holding the graduated glass at arm's length. Then add ¾ oz. of granulated zinc, and follow it with three or four pieces of phosphorus, about the size of a pea. After a short time, gas bubbles will begin to rise, and when they reach the surface they will burst into fire. Soon the whole surface will be brilliantly illuminated with fireballs, and a very striking effect will be produced, particularly if the room is darkened. The display is not attended by any danger, but it is well not to let anyone lean over the bowl while the bubbles are bursting.—S. Leonard Bastin, Bournemouth, England.

### A Simple Needle-and-Thread Holder

To keep the needle and thread in a convenient position while working, the following device has been found extremely handy for the housewife.




Cut to the length of a common spool a piece of brass tubing of a diameter to fit loosely in the center hole of the spool. Solder this tube vertically to a base of some heavy metal, about 3 in. square. Fill the tube with powdered emery, and plug the top with some fancy silk; this acts as a needle container. If a metal base is not readily obtainable, solder the tube to the head of a thumb tack. When in use, the required spool of thread is slipped over the spindle formed by the tube, and the whole is placed in a convenient position.

### Wicks from Felt Hats

No man need buy woven lamp wicks, if he has an old felt hat to cut up. With sharp scissors, cut the felt into strips of the right width for the burners, but be careful not to leave any ragged edges. Then put a strip into each of the burners, just as an ordinary wick. It will give a strong, clear flame, will need little trimming, and will not smoke.

¶Sticky playing cards may be made clean and easy to handle by spreading them on paper, sprinkling with talcum powder, then wiping with a clean cloth.

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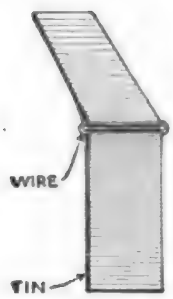
### Nails Hold Cement Walks Together

Cement walks are usually made in two layers, the lower being a coarse mixture of cement, sand, gravel or crushed rock, and the upper being a fine mixture of sand and cement which takes a smooth finish. In many cases the upper layer becomes loose after weathering a cold winter, or in the summer heat. To prevent walks from breaking up in this way, old nails may be used to bond the two layers together. The coarse layer is first poured and tamped in the usual manner, then the nails are inserted, at a distance of from 4 to 6 in. apart, and projecting about ¾ in. above the concrete. The upper layer, about 1 in. thick, or coming not less than ¼ in. above the heads of the nails, is then poured on and smoothed. The result is a walk that holds together, and the first cost is practically the same as the regular walk, if old nails are used.

### A Quickly Made Hinge




A light hinge can be made by cutting two pieces of sheet metal to size, placing their flat sides together, fastening a wire around them at the center, then bending the wings out and nailing the hinge into place. The wire must be strong, for the weight falls on the loop.

### Adjusting Tabulator on Billing Machine or Typewriter

A question of timesaving arises in using the ordinary billing machine. When adjusting the bill form under the roller, it is generally necessary to do some experimenting with the stops, so that the tabulating mechanism will be set to correspond with the arrangement of the columns on the bill. Whatever adjustment is made will only apply to a certain form, and when another kind is used, the experiment must be repeated. To shorten the work, the accounting department of a large store painted the scale on each of their machines to correspond with their bills. Only two forms were used, one with seven columns and one with four, so that white marks made on the scale enabled the operator to set his pointer for the seven-column form, and red marks took care of the four-column form.—Abel Green, New York, N. Y.

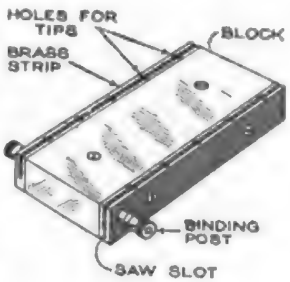
### Paper Shelters for Flowers

Exposure to very bright sunshine is a considerable factor in shortening the lives of many flowers; and excessive rain, even if not violent, can have the same effect—also heavy dew. In such cases it is necessary for the florist to provide some protection, particularly when the bloom is just opening, and has not attained sufficient growth to resist weather conditions which might later on prove harmless.

One of the cheapest and most effective shelters for flowers is a sheet of paper twisted in the manner shown, and fastened by pins to a stick. With such protection the flowers retain their coloring, and last for a much longer time than if completely exposed.

### Multiple Telephone-Receiver Connector

It is often found convenient in experimental work to have a number of telephones connected in parallel, so that a number of men may "listen in" at the same time. The device shown in the sketch is very useful for making such connections, and is easily made in the workshop. It consists of a strip of wood, or other insulating material, on opposite sides of which are mounted two brass strips, which have been partly sawed in two longitudinally, after drilling holes for receiving the cord tips. A binding post is fastened to each strip and is used for making connections. Holes are then drilled on the flat side to fasten the strip to the insulating block. The split strip will be springy enough to hold the small tips very securely. Separate strips can be used if preferred, and grooves filed in them to take the tips. —Frank Sahlmann, Manhattan, Kan.

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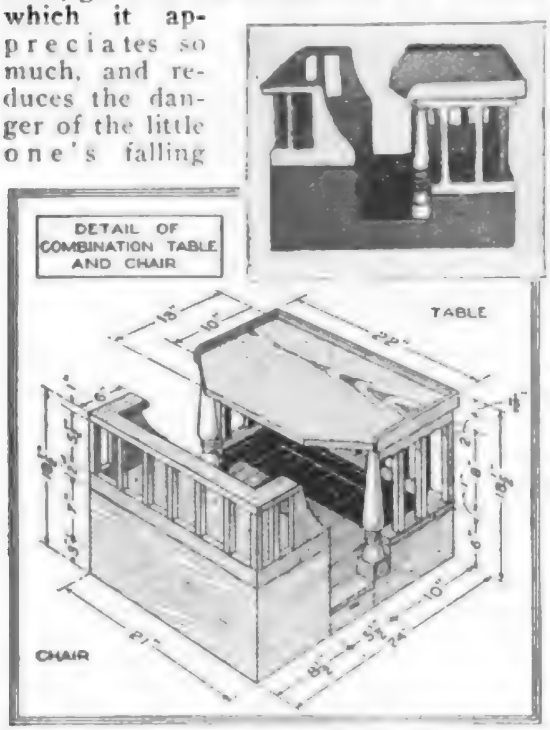
### Child's Table and Chair

A table built somewhat like a child's high chair, but resting directly upon the floor, gives to the small child the freedom which it appreciates so much, and reduces the danger of the little one's falling out. The accompanying photograph gives an idea of the appearance of this chair. The principal dimensions are given in the drawing. If desired, shelves or compartments for small toys or other belongings can be built under the top of the table, and the busy mother will find it a great relief to have a place where the baby may be induced to stay for a fairly long period without encountering emphatic objection on the part of the child. Care should be taken to sandpaper, or otherwise round off, all sharp corners and edges. The table should then be enameled. A good color combination is white for the table, arms, and back, and light green for everything below.—Emil Rehorek, Chicago, Ill.




**A Combination Chair and Table may be Made Very Attractive to the Young Child, and at the Same Time be a Great Convenience to Its Parents**

### Body Dimensions Used for Measuring

In several lines of work the need of a measuring scale constantly arises, and many forms of relaxation, such as gardening, give occasion for taking dimensions. A pocket rule will take care of most cases, if it is always carried; but when it is missing the owner is in a difficulty.

It is possible to be independent of yardsticks and folding scales if certain body dimensions are memorized. The most familiar example is the "pace," or the distance measured on the ground between the two heels when taking a step, a thousand of which constituted a Roman mile. This is still a common emergency measure, but as the same person is likely to take long or short strides in "stepping" distances, it is rather unreliable. The ancient "cubit" became an arbitrary measure, varying in length with different nationalities, but as the word means "forearm," it may serve as another example.

It is a good plan to make a note of certain body dimensions which can be used as guides in measuring an inch and a foot. For the former, use the end joint of the thumb, measuring 1 in. from the quick of the nail to one of the wrinkles over the knuckle; it is not difficult to remember which wrinkle is the right one. For a foot, place the elbow against a wall, and measure the distance between the wall and one of the wrinkles on the wrist. A small person may find it necessary to modify these two methods a little, but he will have no difficulty in using the thumb and forearm as guides.

Sailors sometimes measure fathoms (six feet) on a rope by stretching out both arms at right angles to the body, holding the rope taut between them, and allowing a slight amount over, as the distance is rarely six feet with men of ordinary size. It is not a bad idea, therefore, to mark a horizontal line on a wall, five feet long, and to compare its length with the distance between the tip of the middle finger of one hand and any wrinkle or other mark on the other hand which coincides with the end of the line when the outstretched arms are held against it.

It is a mistake to try to remember too many dimensions, as there is then a chance of forgetting them all; but if more are desired, the span of the outstretched fingers may be used, and the distance from the floor, in even feet or inches, of an eyebrow, face wrinkle, lip, nostril, or other facial mark.—C. L. Lothrop, Jr., U. S. S. "Michigan."

¶ Soap does not dissolve in gasoline, and if plastered over a leak in an automobile gasoline tank it will plug the hole effectively till the car gets home. It is a good plan also to rub soap on the threads of the union nut which holds the carburetor to the intake manifold, thereby making a gasoline-tight joint.

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### Trough for the Food Chopper

Every housewife has cleaned up her table when done with a job of grinding with the food chopper. No matter how careful one may be, crumbs or particles of food escape to the table top instead of falling into the pan used as a receptacle for the ground or chopped food.

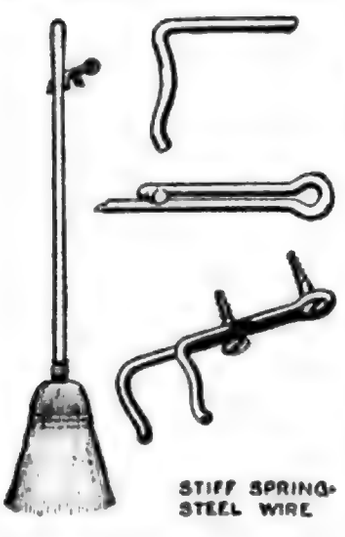
A trough, made from tin, is a great help. It fits closely around the chopper, collects the falling particles, and guides them into a pan. A wire bail at the top of the trough keeps it in place. No dimensions can be given, since there are all sizes of choppers, but the sides of the trough should be made high enough to prevent the crumbs catapulting over. The upper end of the trough is cut with an apron which fits back under the nose of the chopper.

### To Remove Paint from Metal

The amateur painter who wishes to refinish his automobile, or to do any other repainting job on metal where neat workmanship is required, will find it necessary to remove old paint from the surface before starting. To accomplish this easily, saturate one or two large pieces of newspaper with kerosene, lay them flat on the surface which is to be cleaned, and light them at one edge. Then, following the burning edge of the oil-soaked paper, scrape away the soft paint before it cools.

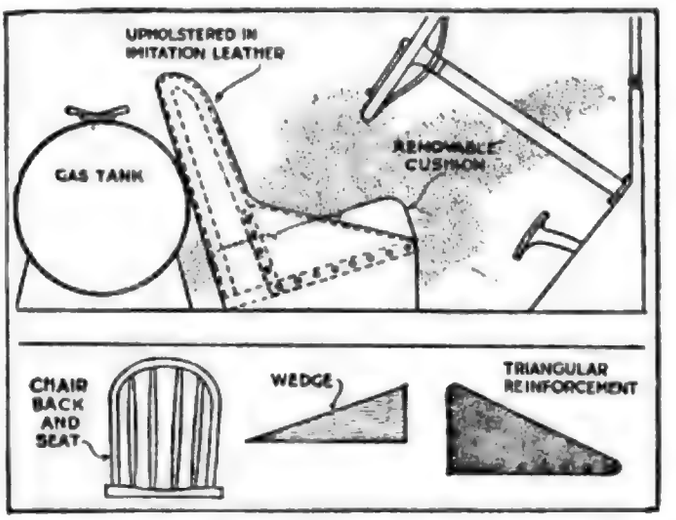
### Bent-Wire Broom Holder

A very simple broom holder, made by bending a piece of stiff steel wire, is shown in the drawing. The broom is inserted by merely thrusting the handle up between the two prongs of wire, and is clamped by the effect of its own weight, when it starts to fall. To remove the broom, lift up the holder, and the broom will drop out. An advantage of a broom holder built on this principle, is that the broom can be inserted or withdrawn by the use of one hand only.—Chas. A. Pease, Monrovia, Calif.




### Speedster Seats from Chairs

Seats suitable for a rebuilt speedster may be made from two substantial chairs,




**Seats for the Speedster-Type Car can be Readily Made from Two Old Chairs, the Legs Being Unnecessary for This Purpose**

and for this purpose chairs which may have been discarded by reason of broken legs are still useful. The legs of the chairs are knocked out, or sawed off flush with the bottom. The backs may be padded, for comfort, but if this is not desired, the frame only may be covered with imitation leather. Detachable cushions for the seats are also covered with imitation leather, and stuffed with hair or excelsior. The solid-bottom type of chair, if used, is strong enough to be bolted through to the car floor, and if desired, a rakish tilt can be given the seats by using wooden wedges. Further reinforcements of the seats can be made by adding triangular pieces of sheet metal on the outside edges of each seat. Where cost is an item to consider in rebuilding a car, this adaptation will result in quite a saving.

### Emery Cloth Smooths Typewriter Platen

Hard service produces dents in the rubber of a typewriter platen. These result in poor work. To remove them, insert a piece of the finest emery cloth or sandpaper, just as if it were to be written upon. Then revolve the roller as in spacing between lines. Repeat until the raised portions are worn down. The type and other mechanism should be protected from grit during the process. Wipe the platen off carefully before using. If it is worn too much, wrap a piece of paper around it, and paste into place. A paper used in this way will prevent the platen from becoming bumpy in the first place.—Mrs. Anna G. Miles, Vermont, Ill.

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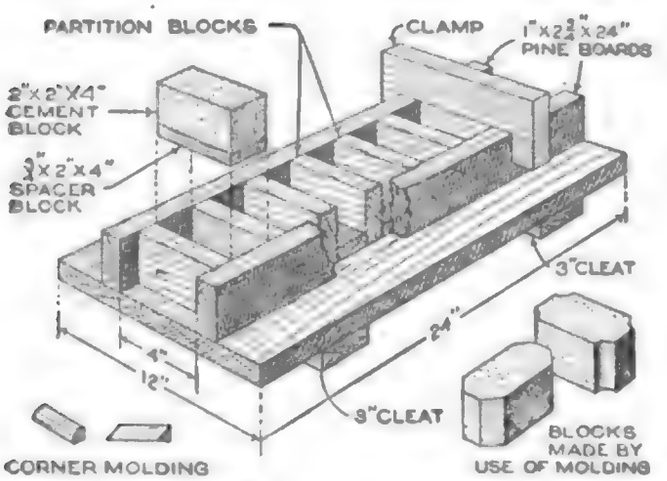
## Making Toy Blocks of Cement

Cement molding, as a hobby, gives very wide scope for individual taste and ingenuity, so that its fascination continues




**From Making Cement Molds of a Simple Type, the Beginner Soon Progresses to Designs of Real Decorative Value**

to grow as the worker develops proficiency. There is not much difficulty in preparing the cement, but a good deal of care is needed in making and fitting the molds.

Begin by making a baseboard, of white pine or poplar. The dimensions given in the sketch will do very well. The board should be planed and sandpapered smooth on the upper surface, and two cleats screwed to the lower surface, as shown, making the holes in the cleats large enough to permit the screws to fit loosely. The cleats will prevent the baseboard from warping. Then prepare the sides of the mold. For blocks 2 by 2 by 4 in., which will be a useful size to the youngster, cut two long pieces for the sides of the mold; seven shorter ones, to serve as partitions, and six spacers, to keep the partition blocks the proper distance apart. The molds can be fastened together with clamps, a good type for the purpose being shown at one end of the board. Two of these are sufficient, one at each end. Different sizes of blocks can then be made, merely by using spacers of different width and thickness. Variety can be given to the shape of the molds by placing triangular or quarter-round pieces in each corner, of the kind shown at the bottom of the sketch at the left. The pattern of these inserts can, of course, be modified according to the taste of the workman, but even the simpler kind will relieve plain blocks of their monotony, as shown at the lower right-hand corner of the sketch. Nothing more is necessary, except a coating of paraffin or shellac, to be laid on all parts of the board that will come in contact with the cement, so as to prevent it from sticking. Paraffin is preferable; if shellac is used, be careful to see that it is thoroughly dry before filling the molds.

Make the mixture of sea-beach, or creek sand, and cement, using one part of cement to two parts of sand. Add water enough to make a thick paste. If a reddish tone is desired, add ground-brick dust to the mixture, using one part of brick dust to two parts of cement and sand. When the material is in the molds, smooth the surface with a wet knife. Ornamental faces can be given to the blocks by pressing upon the top of the mixture while it is still soft, a butter-pat mold, scallop shell, or anything that will leave a clear impression. A more varied outline can be given to the blocks when the workman has become familiar with the materials. Let the blocks dry for several days before removing them from the molds. Trim the edges slightly with an old file, to remove the fur. The blocks will then be almost indestructible.

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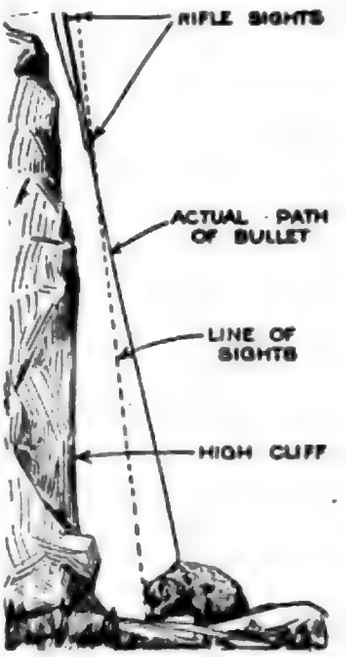
## Why Shooting Downward Is Difficult

Hunters often notice that it is hard to hit game when shooting almost straight downward. The explanation is simple, and its understanding may help in making downhill shots.




A rifle sent from the factory is sighted to shoot accurately at 100 yd.; beyond that distance the sights must be further elevated. No rifle can shoot absolutely point-blank; this is impossible. A bullet drops, when moving through the air, just as many feet per second as when dropped from one's fingers to the floor. In shooting at 200 yd., the bullet must go several feet above the line of sighting in order to "carry up," and hit the target; that is, in order to compensate for the falling of the bullet in flight.

But suppose the muzzle of the gun points almost straight downward. In

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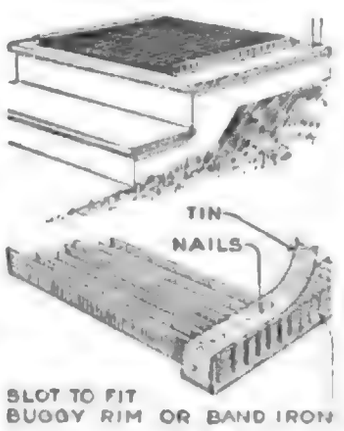
that case, the force of gravity tends only very little to pull the bullet down out of its course; hence an overshot results. A rifle is sighted to shoot in a horizontal position, and when it is turned downward, the ordinary use of the sights will cause the bullet to strike outside of the target. The remedy is in aiming "under" the target, when shooting down. The same is true for shooting upward.

### Inner Tube Used over Bandage

A serious flesh wound in the arm of a child made several stitches necessary. For some time afterward the arm was kept in a bandage saturated with boric acid, and this caused considerable inconvenience, as the child's clothing constantly got wet—also the bed covering at night. His father overcame the difficulty by inclosing the bandage in a rubber sheath, made by cutting a 10-in. piece from an old inner tube, which was well washed and sterilized to prevent infection. A stout piece of wire was passed through the tube, and a loop was made at each end, to which a large handkerchief was fastened, passing over the child's shoulder to serve as a sling. The tube made a waterproof covering for the wet bandage, which gave no further trouble thereafter.—D. Welge, Mason, Nev.

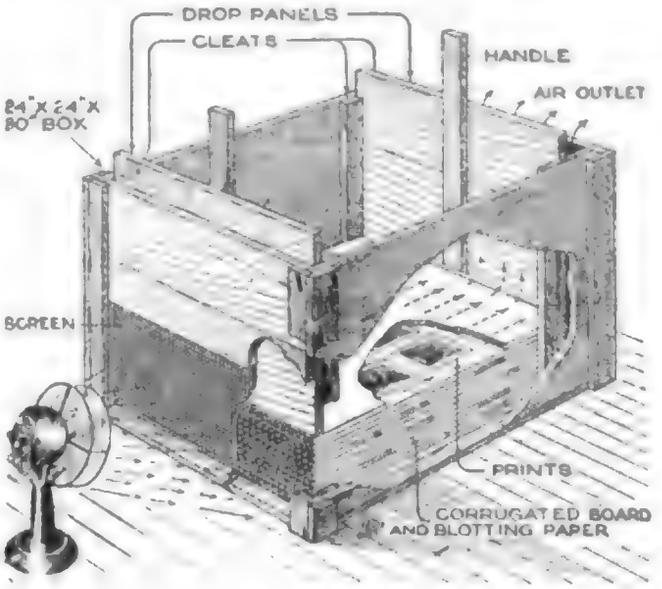
### Foot Scraper Made from Scrap Iron

A foot scraper, or metal porch mat, is a great help toward keeping the house clean in rainy weather. If some old buggy rims or other iron strips are available, the mat can be built in a short time, as shown in the picture. Slots are cut in a square stick of wood, of such width and depth that the iron strips will be a fairly tight fit in them. Tin straps are put on with nails, to keep the iron strips from being forced up out of the slots. If one has a drill to make holes in the metal strips, it is well to put a nail through each end of the outer strips, so as to hold the scraper together. If the other strips are a fairly tight fit in the slots, no fastening will be necessary to hold them in position lengthwise.




### A High-Capacity Print Drier

Where there are many photographic prints to be dried at one time, as in a commercial gallery, some means of doing the work quickly and well becomes a necessity.




**A Simple Drier, Having a Capacity of Several Hundred Prints, Leaves the Print Flat, and Does the Work Rapidly**

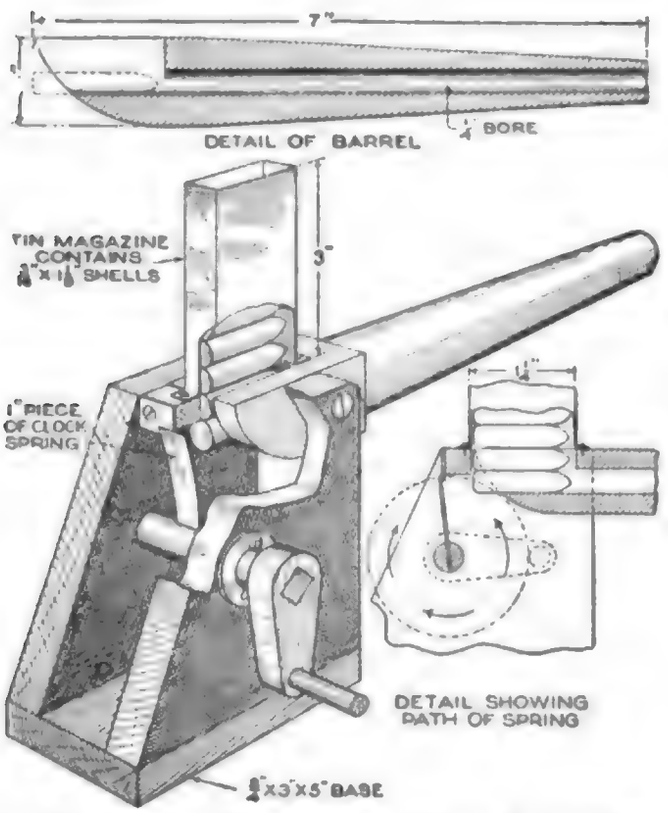
The box is made from ½-in. stock, or may be obtained from a store. A piece of screen is set into an opening cut in the lower half of one end. Cleats nailed to the sides of the box, ¾ in. from this end, permit the insertion of a drop panel made from ½-in. lumber and fitted with a cleat which serves as a handle. Two cleats on each side, at the other end of the box, make a groove into which another drop panel fits, but this panel is held 2 in. from the end of the box, leaving an air space.

To dry a number of prints, place a sheet of corrugated strawboard on the bottom of the box, then a sheet of blotting paper, upon which the prints are arranged, face up. A strip of muslin is placed on top of the prints, after which the layer process is continued until all the prints have been placed in the box. The stack is covered with a sheet of corrugated board, the panels are inserted, and the electric fan set in operation in the place indicated.

Such a device carries out the drying process rapidly, since a continuous stream of air circulates through the box, removing the moisture quickly. But the even more valuable features are the high capacity of the box, which holds hundreds of prints, and the fact that it dries them absolutely flat.—Dale R. Van Horn, Lincoln, Neb.

### Toy Spring-Operated Machine Gun

A machine gun, firing wooden ammunition as fast as the crank can be turned, will attract the favorable attention of




**At the Crank of This Machine Gun is Turned, the Wooden Bullets are Fired One by One by the Spring Until the Magazine Is Empty**

nearly every boy. Such a gun, as shown in the drawing, can be made very easily, out of material which costs almost nothing.

The wooden gun barrel is turned down to size, and bored. A slot is cut near one end, reaching down to the bore, to allow the ammunition to drop from the magazine into the barrel. The underside of the barrel is rounded off, as shown, for the spring which must pass under from the rear. The barrel is then mounted between two wooden supports, attached to a base.

A piece of a stiff clock spring is fastened securely into a slot cut in the shaft, which is a round piece of hard wood. It is fastened by riveting a small brad through the wood, and through a small hole punched in the spring. The shaft is mounted just below the rear end of the gun barrel, so that the spring will slip against the lower "shell," after first catching on a projection left in the upper part of the barrel. When the crank on the shaft is turned, the spring strikes this projection, bends backward, then slips forward with a jerk which drives the wooden bullet forward with great force. The shaft is held at exactly the right point to keep the spring in place, by putting a cotter pin in each end of the shaft, with a washer between each cotter pin and the support, to keep the pin from cutting into the wood. The crank may be either a piece of sheet metal with a small bolt for a handle, or a piece of wood, with a wooden handle. The end of the shaft is cut square so that it will turn with the crank.

For a magazine, a piece of tin is bent and soldered into a shallow box, with open ends. At the lower end lugs are provided, to keep the magazine in place. The wooden bullets are slipped into the upper end of the magazine. When the crank is turned, the spring drives the bullets out one by one, a new bullet falling into place as the one before is fired.

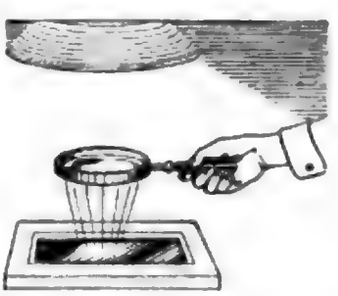
If well made, this machine gun should work rapidly, and should fire the bullets several yards, and with great force.—J. Horace Van Nice, Waukon, Ia.

### Putting an Egg into a Bottle

An egg may be put into a bottle which has a mouth much smaller than the egg. First soak the egg in vinegar until the shell becomes soft and pliable. It will then be easy to force the egg into the bottle. Pour cold water into the bottle, and allow it to remain until the shell becomes hard again. The bottle can then be shown to friends, who are certain to be greatly mystified by the sight of an egg in such a place.

### Printing Up Uneven Negatives

A valuable negative may have a light or faded spot in a prominent portion that destroys the beauty of the print to a great extent. Strengthening the light on this spot while printing will often remove this defect.



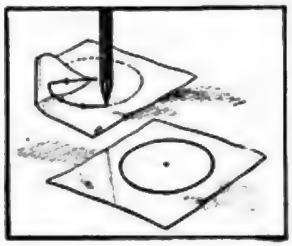
This can be accomplished by using a large reading glass to concentrate the light on the desired spot. The glass should be held between the light and the printing frame, moving the glass up and down to prevent the formation of a dark spot. At no time, however, should the light be brought to a sharp focus.—Thos. W. Benson, Philadelphia, Pa.

### Tightening Tobacco-Pipe Stem

When a tobacco pipe has a hard-rubber stem which fits too loosely into the bowl, a snug fit can be made by heating the end of the stem slightly, so as to soften it. The stem can then be expanded by pressure against the end. It is advisable, while expanding the stem with one hand, to pour water on it with the other, when the desired diameter is reached. If the stem is made too large, it can be sandpapered or filed down to the right size.

### The Dot in the Circle

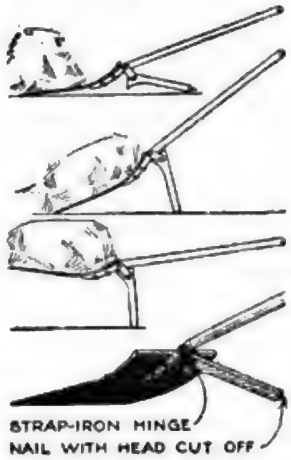
Ask some one to draw a circle with a dot in the center of it—or near the center—without any line joining the dot and the circle, and yet without taking the pencil from the paper. This trick sounds impossible, but is very simple when the solution is explained.



Turn over a corner of the paper, and make a dot near the point of this same corner, on the body of the sheet. Run the pencil up the turned-over corner a short distance and begin to draw the circle, as indicated. When the pencil reaches the surface of the paper on which the dot is, turn back the corner and complete the circumference around the dot on the paper, as a center.

### Fulcrum Attachment for Snow Shovel

Lifting heavy loads of snow from the walk becomes tiresome very quickly. The foot shown in the drawing prevents backache, by lessening the tiresome stoop and the straight lift of the heavy load.



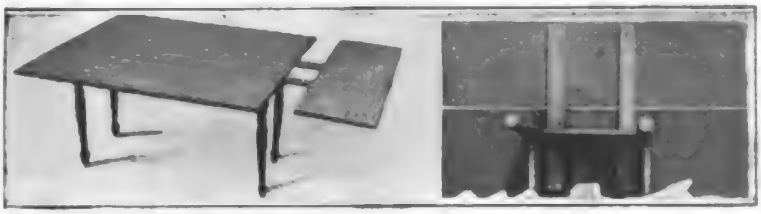

The foot is a piece of hard wood, 15 in. long, 4 in. wide at the top, and tapering toward the bottom, where a headless nail is set, extending about ½ in. Two small straps of iron, one on each side of the foot and the shovel handle, serve as hinges. Thus the foot swings back away from the rear of the shovel easily, but projects at right angles from the shovel blade when the handle is vertical.

Push the shovel under a load of snow; raise the handle, kick the foot forward, and push the handle down, pulling back on it enough to prevent the foot from folding. The shovel load is thus brought up within easy reaching distance, where a side swing sends the snow off to the side.

¶ Casters will not drop out of chair legs if the holes are filled with melted paraffin just before the casters are put in.

## A Simple Table Extension

An extension leaf which greatly increases the capacity of a table, can be so made as to permit quick attachment or removal. A board of the same material as the table top is cut long enough to fit across the end of the table. Two strips, 3 in. wide, 3 ft. long, and ⅞ in. thick, are screwed to the underside of the leaf, near the center, and about 18 in. apart. These strips slip through notches cut for them in the framework around the table legs. The notches must be a close fit so that the leaf will be held level with the table top. The leaf is carefully sandpapered, and the corners rounded. The wood is then finished to match the finish of the table. If the work is properly done, the leaf is readily adjusted or removed, stays firmly in place, and is as satisfactory as the table top itself. Other leaves may be added at end or side, thus making it possible to almost double the size of the table.



**An Extension Leaf, Which Adds to the Effective Size of the Table, is So Constructed That It can be Quickly Removed**

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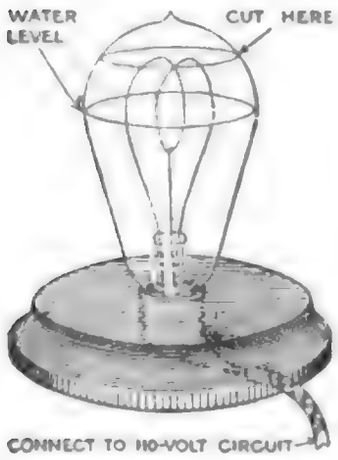
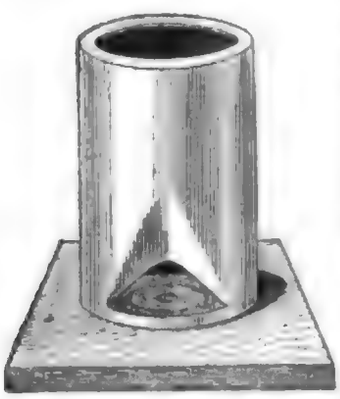
### Water Heater Made from Lamp Globe

A handy heater, which can warm quickly small quantities of water, such as may be required for shaving, is readily made from an ordinary 16-cp. carbon electric lamp. The upper part of the globe is cut off by the use of a three-cornered file, or some other means, and the base of the lamp is mounted in a broad wooden base. Connection is made from the contact surfaces of the lamp, to wires leading to the 110-volt lighting circuit. In use, the globe is filled with water to about 1½ in. from the upper end of the filament. When the current is turned on, nearly all of the heat developed goes to heat the water, and this is accomplished in a very short time, without requiring any attention.—George MacLean, Robertsonville, Quebec, Can.




### Tin-Can Chicken Feeder

A convenient chicken or rabbit feeder, that will hold a continuous supply the animals cannot soil, is easily made from a tin can. Simply cut out the top of the can smoothly and make a cut in the side, ½ in. from the bottom, extending a fourth of the circumference. Bend in the cut side, so as to form a small recess. Grain poured into the top of the can will run out into this recess so that the animals can feed, but it will not overflow the half-inch edge. Be careful to smooth all the edges, so that the animals cannot injure themselves in feeding. For large flocks, where it is desirable to feed several at once, use the large 1-gal.-size cans, and cut several recesses. If large, square cans are used they can be cut at all four corners. Covers which will protect the feed during bad weather may be made of wood or galvanized iron.—Doncaster G. Humm, Upland, California.

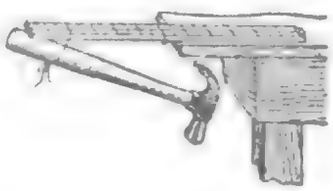


### To Make Artificial Moonlight

Moonlight effects are often wanted for entertainments and plays, but are very difficult to produce on the stage. An exceedingly close imitation may be made by use of an electric arc lamp, with copper electrodes instead of the usual carbon. These copper electrodes are cut from ½-in. copper rod. With a current of from five to ten amperes they will not overheat, and will produce a light of the right color, with well-defined shadows that simulate actual moonlight. The arc requires but very little attention.—K. M. Bard, Manawa, Wis.

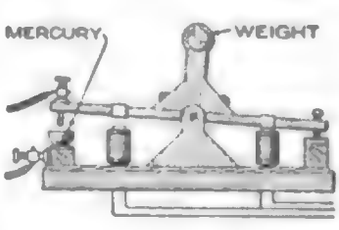
### The Rule-and-Hammer Trick

Lay an ordinary 2-ft. folding rule, half opened, on the table; push it to the edge of the table so that half of the rule falls and hangs vertical. Lift this hanging end to a horizontal position, and challenge somebody to hang a hammer on this end so that it will not fall. This will sound absurd unless one happens to think of the solution. After the victim has been sufficiently bewildered by the declaration that the job is easy, it will not be difficult to attach the hammer as shown, so that it will hold its position. The experiment should first be tried in private, so that the performer can familiarize himself with the exact position at which the hammer will have to be tied.——F. H. Sweet, Waynesboro, Va.



### Relay Switch with Mercury Contact

Circuits under pressure up to 110 volts, or more, may be opened or closed from a distance by means of the relay switch illustrated. A wooden lever, 8 or 10 in. long, is pivoted between two uprights fastened to a wooden base. Two small pieces of soft iron, secured halfway between the pivot and the ends of the lever, serve as armatures for the two magnets mounted on the base. A binding-post screw, in one end of the lever, makes contact with a cup containing mercury, which is placed on the base directly under the lever. A



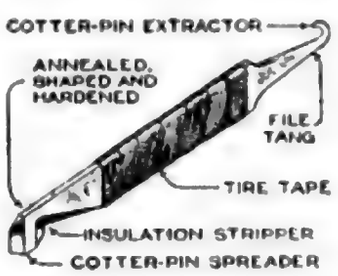
battery-control circuit is provided with a two-point switch, so that either of the magnets may be energized separately, by throwing the switch arm to one side or the other. When the magnet on the side of the lever which carries the binding-post contact is in the circuit, the magnet pulls the armature down, thus causing the binding-post screw to make connection with the mercury in the cup. The contact and cup are connected as a switch in the high-voltage circuit. When the other magnet is connected, the lever is pulled the other way, thus breaking the circuit. To hold it in position when the low-voltage current is off, a weight is fixed above the lever. This saves battery current by automatically holding the lever to whichever side it is thrown.—R. C. Hitchcock, Middletown, Conn.

### Erasing Shield from Old Film

A very good draftsman's erasing shield can be made from a piece of photographic film. The emulsion is removed by boiling, thus leaving the film entirely transparent. After cutting the film to about 2 by 4 in. in size, ovals, circles, and rectangles of various sizes are cut in it with a very sharp knife, or a razor blade. This makes a shield that can be held over the work, without preventing the draftsman from seeing the lines on the drawing. The best type of film to use is the so-called "portrait film," which is heavier than other grades.

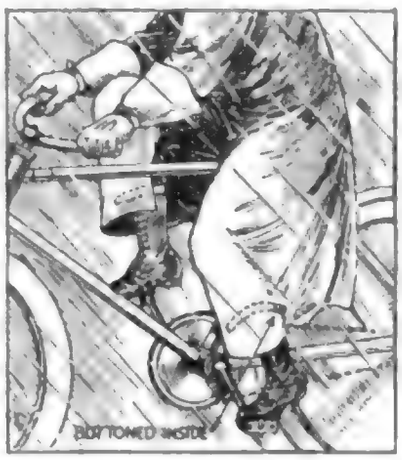
### Combination Tool Made from File

As the steel used in files is of high quality, it is preferable not to throw them away after the cutting faces have worn to such a degree that they can no longer be used for filing. Old files can be used for small chisels, scribers, center punches, etc. The tool illustrated, for extracting cotter pins and setting them in place, and for stripping the insulation from electric wire, was made by an automobile mechanic from a discarded file. The steel was annealed by being heated and cooled slowly, and was then shaped as shown in the sketch. It was tempered by being heated to a cherry-red and plunged in oil, after which the center was wrapped with tape to form a handle.




### Cyclist's Raincoat Attachment

A man who had occasion to ride a bicycle quite often in the rain, found it a comfortable practice to mount straps on the lower corners of his raincoat, as indicated. These straps, when fastened around the leg, prevent the coat from swinging clear of the legs, and thus afford a much better protection from the rain or snow.—Wayne W. Leyrer, Atlantic City, New Jersey.




### Corks Prevent Heel Slipping

A leather heel which has worn smooth may be prevented from slipping on floor or carpet by inserting corks, or other nonslip material, into holes drilled in the heel. Three ½-in. holes, drilled in the leather to a depth of from ⅜ to ½ in., will be sufficient. Ordinary corks, rubber stoppers, or rubber plugs cut from old automobile casings, will be good, but the plugs from old casings wear longest. The material must be larger than the holes in the heel, so that it is forced in, and so that it projects slightly beyond the surface of the leather. When one set of plugs is worn out, another may be inserted.—Forrest Benson, Boulder, Colo.

### Wire Stand for Paper Drinking Cups

A single piece of stiff brass or nickel-plated wire, bent as shown in the sketch, makes a neat and attractive holder for individual paper containers, used for ice cream and drinks. A holder of this design is sanitary and inexpensive, and is not subject to damage by dropping on the floor, as it readily springs back into the proper shape.—Elmer S. Tetzloff, Chicago, Ill.

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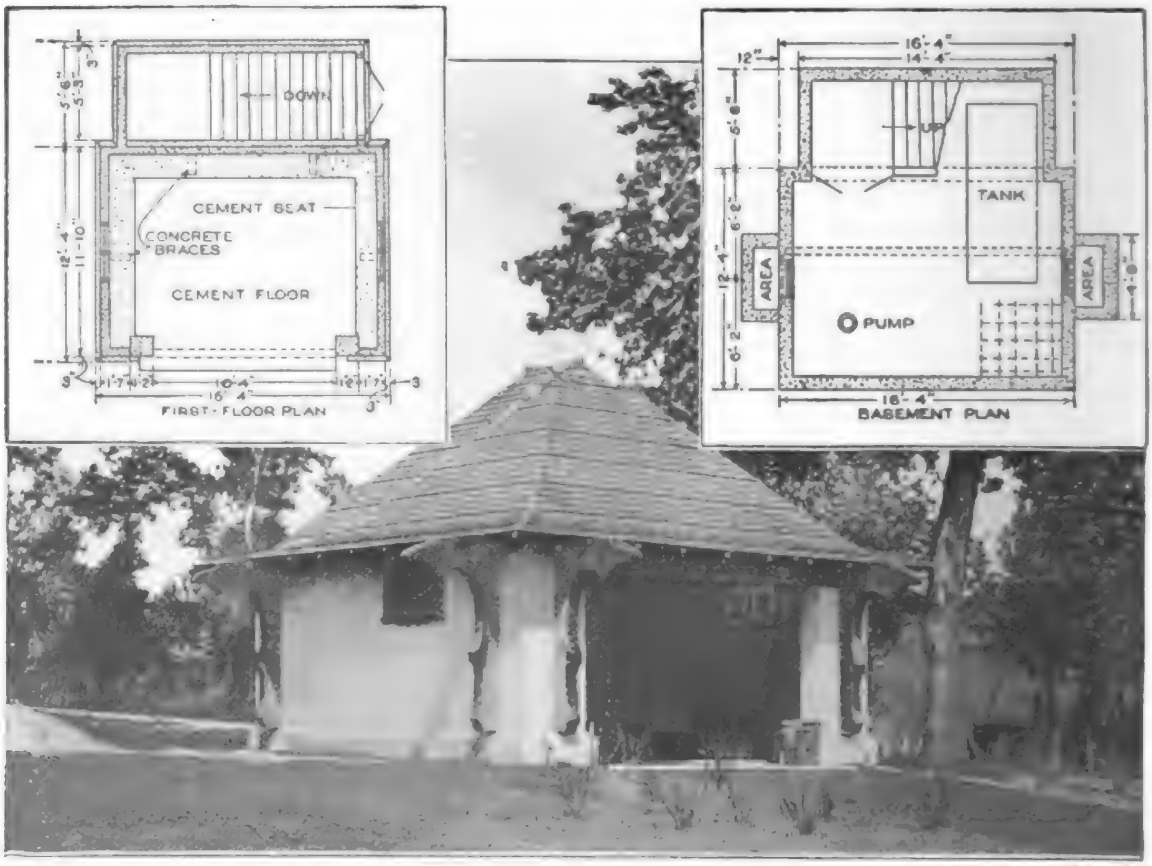
# PRETTY SHELTER HOUSE IS PUMPING PLANT TOO




BALCH & LIPPERT, ARCHITECTS

**Bus-Line Waiting Station of Stuccoed Concrete, with Shingle Roof and Cypress Cornice Brackets of Distinctive Shape: Left-Hand Floor Plan Shows Waiting-Room Arrangement, with Cement Bench around Walls, and Location of Stairway. Right-Hand Plan Indicates Arrangement of Pump and Tank in Basement**

A PRETTY residence suburb on a bus line running out of a college town in southern Wisconsin is marked by a waiting station of unusual character. Its interest lies not only in its attractiveness and the satisfactory way in which it meets its more obvious purpose, but also in a highly important function which it performs without any external evidence whatsoever. For the basement of the little shelter house is a full-fledged pumping station, with an automatic electric pump, serving water at 95-lb. pressure from a 100-ft. well to the homes of the neighborhood, and a 4 by 10-ft. concrete reserve tank.

The over-all dimensions of the building are 16 ft. 4 in. wide and 17 ft. 10 in. deep. The rear portion, however, is occupied by a stairway to the basement, which is entered from the outside and has no connection with the waiting room. The latter measures 13 by 15 ft., with the front open to a width of 10 ft. 4 in. The floor is a reinforced-concrete slab, 6 in. thick, and a cement seat, built upon the top of the foundation wall, runs entirely around the three sides of the room. The basement pump room is finished wholly in concrete. The stucco waiting-room walls are paneled with wood strips, and high windows in the sides are latticed but not glazed, being protected by the deep cornice.

Outside, the wall is finished in rough, gray stucco on galvanized metal lath. At each outside corner of the building two heavy wood cornice brackets of peculiar shape give distinction to the whole structure. All woodwork is of cypress, with two coats of brown paint, the last coat sanded before it was dry. The little depot cost only a few hundred dollars, and could easily be adapted to any location.

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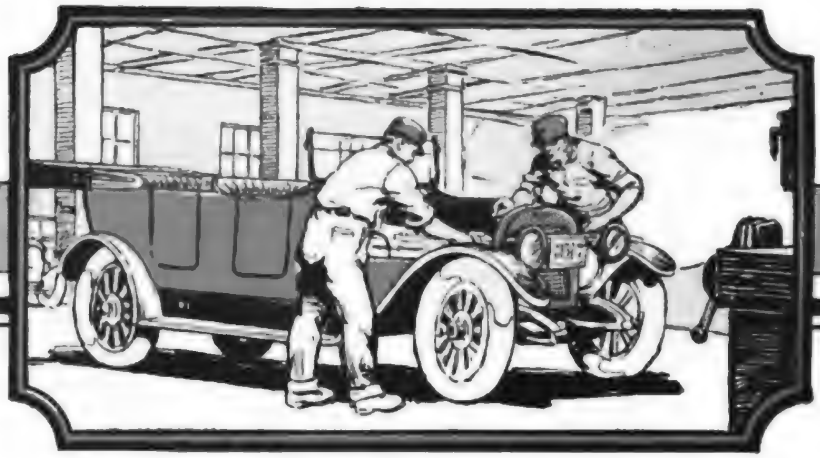
BRIDGES
BUILDERS



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Vol. 32

## Contents for December, 1919

No. 6

Accident—Auto Plunges Onto Deck of Tug..... 884
Accident, Automobile, Occupants Escape in..... 869
Accident to Motorcycle, Wet Sand Causes..... 896
Acetylene Torch, Yeggmen Burn Safe with..... 831
Aeroplane—Biplane is Descendant of Cross Channel Bus ..... 821
Aeroplane Cabin, Insulated, Business Office in.... 886
Aeroplanes, Canada and Southern Ports Linked by .. 832
Aeroplane, City Street Service Station "Gasses".. 842
Aeroplane Display Room, Church Auditorium as.. 902
Aeroplane Engines, Magnesium Pistons for..... 876
Aeroplane, Land, Tests Passed by..... 814
Aeroplane, Largest, Preparing for Trial Trip..... 811
Aeroplane Service, English Business Men Value... 894
Aeroplane, Three Mile a Minute Speed of..... 823
Aeroplane to South Pole, Plans for..... 834
Aeroplane, Wireless Steered, Germans Claim..... 829
Aeroplanes, Bridges Flown under by..... 901
Aeroplanes, Nonwooden Propellers for..... 868
Air Race Around World, Plans for..... 880
Airplane Supercharger, Altitude Mark Set by..... 898
Alkaloid, New, Desert Shrub Yields..... 919
Apple Tree, Thirty-Six Varieties from..... 888
Arch, Memorial, over Business Street..... 828
Armor, Ancient, Museum Displays..... 832
Asphalt Pavement, Cobblestones Used as Base for.. 913
Automobile Body, Camping Trailer Made from.... 879
Automobile, Cleated Plates for Wheels Aid to..... 922
Automobile, Foot Power, England Uses..... 809
Automobile Grease Cup, Handle on Cover of..... 922
Automobile, Japanese, Weighs 120 Pounds..... 820
Automobile, Light, in England..... 836
Automobile Parts, Jet of Steam Cleans..... 898
Automobile, Pneumatic Tire Boot for..... 829
Automobile Tire Chains, Metal Carrier for..... 919
Automobile Truck Chassis, Home on..... 833
Automobiles, Crossing Rights for..... 895
Automobiles, Mechanic's Cheap Construction of... 894
Aviation—"Flying Parson" Wins Longest Air Race, by Paul A. Jenkins..... 819
Aviators, Bureau Forecasts Weather Conditions for 898
Balloon, Free, Floats over New York City..... 912
Balloons, Faker Uses Gas Tank to Inflate..... 853
Bamboo Grove Planted in Georgia..... 845
Banks, School Children's, Regular System for..... 879
Beet Harvester, Motor Driven..... 871
Boars, Wild, Camera Catches..... 837
Boat Hull, Wood and Steel Combined in..... 904
Boiler Corrosion, Coke Fuel Causes..... 836
Boulevard Link, Temporary, Wood Incline for.... 890
Boys of New York, Military Training for..... 829
Bricks, Building Campaign Dinner Announced by.. 901
Bridge, Concrete, Longest Arch Claim of..... 863
Building, Brick-Concrete, Electric Drums Move... 879
Building, Factory, Four Wings Feature of..... 906
Building for Fire Sale, Record Construction of.... 839
Building, Thousand Employes to be Housed in.... 873
Cakes, Elaborate, Western Chef Molds..... 893
Calculator, Anti-Aircraft Fire Control Simplified by 912
Caldrons, Bamboo, Chinese Salt Manufacturers Use 860
Camera, Repeating, Takes No "Doubles" or "Blanks" ..... 833
Canal, Concrete, Curious Method of Enlarging..... 908
Canal under Jerusalem, Holy Land Irrigated by... 823
Car Fare Tokens, Metal, Street Railways Use..... 917
Carpet on Floor, Scrubbing Machine Cleans..... 873
Chair, Walking, Convalescence Encouraged by..... 900
Chess Player, Expert, Forty Against..... 834
Children's Pages ..... 920
Civic Features for Visitors and Residents..... 910
Clock, Odd Use of Gravity Made in..... 916
Clock, Twenty-Four Hour Dial on..... 888
Cockleburs, Oil from, by S. R. Winters..... 859
Comment and Review, by H. H. Windsor..... 817
Concrete Jackets, Poles Anchored by..... 858
Concrete of Cinders, Houses Built with..... 834
Concrete Wireless Mast, Wall of Peking Topped by 857
Cream for Exportation, Danish Machine Preserves 838
Dam, Flood Menace Will be Removed by..... 870
Dam, Irrigation, Illumination Guards..... 907
Diamond Hunters, Diving Bells Used by..... 907
Disk, Tilted, Crankshaft in Motor Replaced by.... 841
Drill, Testing, Samples Cut from Pavements by.... 872
Dry Dock, Swedish, on Land..... 824
Dye Industry, War and Medicine Depend on..... 863
Dyes, American, New Shades of..... 878
Electric Machines, Sound Vibrations Control..... 862
Electricians, Naval, Trained on Land Ship..... 829
Emblem, Germany's, One-Headed Eagle on..... 866
Explorers, Arctic, in Rowboats, Storm Encountered by ..... 855
Explosion, Millions Lost on..... 844
Explosion of Gasoline Boat, Back Fire Causes..... 858
Fence, Concrete, Tractors Kept in Testing Field with ..... 810
Fever, Yellow, Sanitation Frees World from..... 902
Fish, Gold, Red, White, and Blue Marks on..... 832
Fish Schools, Seaplanes to Locate..... 803
Flash Light, German, Dynamo in..... 804
Fog Signals, Lighthouse Wireless Sends..... 842
Forest Fire, Volunteers Beat..... 844
Fountain, Drinking, is Germ Free..... 808
Fountain Pen, Illuminated, Battery Carried by.... 806
Freight Car Door, Attachment Opens..... 831
Fruit Drying Machine, Waste Saved by..... 843
Fruit, Juice Extractor, Electric..... 904
Fuel System for Trucks and Tractors..... 918
Furnace, Hearth Forms One Electrode of..... 917
Gallows, Artists' Model Held by..... 803
Garage, L-Shaped, Cars Use Single Door in..... 827
Gas Engine Theory, Dissected Models Teach..... 838
Gas Mask, War Veteran Asphyxiated in Test of.. 912
Gas Mask, Woman Peels Onions Wearing..... 902
Giraffe, Stubborn, Carried to Winter Home..... 840
Glass, Optical, Dents Easily Made in..... 919
Granite Quarry, California's, Nation Supplied by.. 881
Hay Press, Self-Threading..... 892
Helmet, Soldier's, Lighting Fixture Made of..... 828
Helmet, Soldier's, Statue of Liberty Wears..... 872
Highway, Four Mile, New York Pays High for... 904
Hogs, Portable Scale for Weighing..... 838
Hotel, Sportsmen's Floats on Lake..... 835
House Boat, Piles Dry Dock for..... 855
Household Devices ..... 914
Indicator, Airplane Ground Speed Shown by..... 918
Influenza Germ, Scientists Conduct Search for..... 908
Ink Bottle Holder, Fiber Board Used to Make..... 816
Insurance, Aerial, Company Writes Many Forms of 894

[Continued on Page 4]

## [Contents—Continued.


Jetties, Cutting of River Banks Stopped by..... 814
Jury Pole on Wagon, Escape from Desert by Aid of 864
Ladder, Sectional, Stepladder Converted into..... 919
Lamps, Experimental, on City Street..... 873
Leather from Fish Skins, New Curing Process for.. 886
Lifeboat Launching Device, Disasters Prevented by 885
Light, Yellow, Scientific Basis for Popularity of... 862
Lighthouse, Telephone Links with Mainland..... 841
Loader, Manure, Rotary Pitchfork on..... 862
Locomotive, Air Propelled, European Builds..... 913
Locomotive, Storage Battery, Train Pulled by..... 906
Log Cabin, Office of Real Estate Agent in..... 896
Logs, Motor Truck Trailers Carry..... 824
Logs Shooting Long Chute, Friction Sets Fire to.. 892
Lumber Mill, International, Duty Escaped by..... 869
Mail Carriers, City without..... 828
Map of Texas, Relief, Resources Shown by..... 894
Meter, Vessels' Visibility Gauged by..... 815
Milk Bottles for Babies, Machine Sterilizes..... 846
Mine Rescue Crews, Oxygen Apparatus for..... 866
Mine Stoping Drill, Air Rotates..... 846
Mines of Antiquity in Sinai, Inscriptions in..... 830
Mirage, Highway, Auto Appears Double in..... 804
Molds, Paper, Concrete Test Cylinders Made in.... 896
Monkeys, Typewriter and Wading Pool for..... 812
Monument, Reinforced Concrete, Novices Fashion 814
Motor, Tiny, Dental Tool Holder Conceals..... 901
Motorboat for Commuters, Auto Speed for..... 840
Mountain, Moving, Engineers Check, by H. Thomas 805
Moving Pictures, Barren Isle Made Tropical for... 856
Moving Pictures—Bible to be Filmed..... 820
Muffler for Airplane Engines, Army Adopts..... 857
Music Roll, Motor Moves Music on..... 839
Navigation Laws, American, Modernizing..... 853
Newspaper in Shorthand for Indians..... 842
Observatory, Scenic, Grain Elevator Tower is.... 900
Ocean Port, Detroit Plans..... 871
Oils, Oriental, Tests Determine Value of..... 868
Organs, Two, Organist Plays Simultaneously..... 916
Paper Riveter and Punch Like Two Jawed Pliers.. 916
Paraffin and Pulp, Waxed Paper Waste Yields.... 848
Park, Made Land in Lake Michigan for..... 888
Park, Small Town, by Avis G. Vestal..... 849
Pasteurizer, Bottle Milk, Triple Use for..... 843
Pearls, Tripe Yields..... 816
Photography, Improved Equipment Aid to..... 861
"Photophone," Vibration of Beam of Light Operates ..... 811
Piano Tone Volume, Slots Increase..... 804
Pigeon Hunters of Pyrenees, Methods Used by.... 891
Pirates of the Silver Main, by L. W. Pedrose..... 882
Plant Specimens, Forest Rangers Collect..... 835
Plywood, Strange Composition for..... 878
Pneumatic Tool, Shipbuilders Test..... 824
Potato Flour Production Becoming Important..... 903
Propeller Revolves Parallel with Ship's Side..... 916
Radio Station, Largest, for Buenos Aires..... 872
Railroad Ties, Special Cars for..... 840
Rain Gauge, Weekly Record Written by..... 895
Ramparts of Paris, City Razing..... 870
Reel for Wire and Rope..... 816
Refrigerator Car, Automatic Cooling System in... 909
Rice Thresher, Tandem Tractors Drive..... 881
Ring, Signet Conceals Identification Disk on..... 922
River Seine, Test Water for Transparency of..... 909
Rock Pillar in Ceylon Is Old Fortress..... 825
Roof, Precast Concrete, Fits Like Puzzle..... 832
Safety Match Boxes, Inexpensive Coating for..... 810
Salesmen in France, Credentials Needed by..... 909
Sand for Locomotives Supplied Like Water..... 905
Saw, Swinging, Locks Away from Operator..... 863
Scrubbing and Floor Polishing Machine..... 844
Seaplane Bases for Transoceanic Air Travel..... 847
Seaplane Tours to Brazil, Navy Plans..... 896
Seaplanes, Floating Supply Bases for..... 847
Semaphore, Traffic, Motor and Clockwork Operate 880
Sewing Machines, Improved, Time Loss Cut by.... 897
Shaving Articles, Aluminum Case for..... 922
Shearing and Punching Machine Combined..... 871
Sheathing, Metal, Paper Takes Place of..... 858
Ship, Farragut's, Church to Acquire Mainmast of.. 877
Ship, "Grampian," Collides with Iceberg..... 878
Ship, "Imperator," (Ger.), U. S. to Keep..... 886
Ship, Submersible, May Alter British Navy..... 928
Ship, "Valbanera," Quicksands Swallow..... 802
Ship Welding Set, Motor Truck Hauls..... 812
Ships, Oil Fuel to be Used on..... 809
Ships, Sail Rigged, Motorboats Made from..... 874
Ships, Ten Deck, for American Service..... 830
Shipworms, Salt Water Brings to Panama..... 802
Shipyard, Hog Island, to be Transatlantic Terminal 830
Shoe Leather, Blocks Tied to Feet Save..... 835
Shoes, Record Size, of Circus Woman..... 836
Signal, Illuminated, Crossing Protected by..... 876
Signal Tower, Storm Warnings from..... 893
Silo, Old, Railroad Store in..... 890
Slack Stored under Water, by G. F. Paul..... 897
Sled, Alaskan Uses Bicycle Wheel to Motorize.... 878
Smoke Law, Telescopes Discover Violations of... 853
Soap, Water of City Softened to Save..... 816
Soldier Dead, France Refuses Permission to Remove ..... 916
Sound, New Instrument for Measuring..... 855
Spark Plug Tester, Plug in Chamber of..... 886
Stamp By-Products, Government Finds Use for... 875
Stamp Moistener, Aluminum, Perforated Cap on... 836
Station, Waiting, Pumping Plant in..... 900
Steam Cooking, Plant in Field for..... 888
Stilts, French Sheepmen Use..... 875
Store, Machinery Serves Customers in..... 856
Store, Odd Feature in Basement Attraction of..... 822
Street Car Rides, Length Determines Cost of..... 913
Stumps, Clearing Method Burns Only Roots of... 880
Submarines, German, Metal Fish Tracked..... 906
Sugar and Alcohol Producers, Process Aids..... 848
Surgery—New York Diagnostic Clinic, by W. P. Goodwin ..... 865
Survey, Commercial, Brazilians Make..... 894
Tailors, Stocks and Knee Breeches Revived by.... 918
Tank, Europeans Mountaineer in..... 830
Tanks, Powerful, American Arsenal Builds..... 827
Theater, Danish, Concrete Dome Crowns..... 897
Timber Line of North Creeps South..... 858
Timbers, Roof, Test Preserving Method for..... 902
Toboggan Slide, Russian, Accidents on..... 862
Tomb, Trapper's, Lonely Log Cabin is..... 814
Tree, House-Moving Methods Used to Transplant.. 892
Truck with Elevator Body for Ice Cars..... 861
University Campus, Chicago Lake Shore to Have.. 804
University, Princeton, Chair of Diplomacy Planned for ..... 836
Valve, Automatic, Closes When Pipe Bursts..... 912
Valve Box Covers, Cast Iron Cap Seals..... 822
Valve, Pressure in Balloons Kept Uniform by.... 810
Veneer, Moist, Better Results from Gluing..... 890
Viaduct, Concrete, Novel Expansion Joint on..... 877
Village, Grand Pré, Disappearance of..... 873
Village of Eskimos, Prehistoric, Scientists Unearth 901
Violin Attachment, False Notes Impossible with... 810
Volcano—Lava Spouts from Mauna Loa..... 883
Walnut Harvesting, Simple Device for..... 902
Warship, "Leonardo da Vinci," Salvaged from Sea 890
Water Tank, Concrete, Attractive Tower Conceals.. 901
Water Trough for Horses, Street Sprinkler Used as 892
Water Wheel, Kaiser in Effigy Turns..... 870
Weed Exterminator, Soil Pulverized by..... 894
Well Coverings, Tent Shaped, in Kansas..... 888
Wheels, Huge Machines Form Direct from Bars... 889
Windshield, Double, Open Vision Slit Provided by 894
Windshield Screen, Insects Kept Out by..... 886
Wireless Messages, Machine Sends..... 845
Wood-Oil Industry, Chinese..... 846
X-Ray, Chemicals Analyzed by Means of..... 816


### SHOP NOTES


Automobile, Cabinet for Salesman's Stock on..... 925
Automobile, Closed, Extra Front Seat for..... 929
Automobile Radiator, Preventing Freezing of..... 927
Bushings, Removing Play in..... 931
Center Punch, Spacing Device on..... 930
Chains, Motorcycle Drive, Oiled While Running... 937
Clip, Test, Safety Insulation for..... 928
Crutch, Steel Pointed, Ice Traveled on with..... 943
Dishwashing Machine, Water Power..... 929
Drawing, Isometric, Triangle for..... 926
Eye, Light Removes Particles from..... 931
Fence, Snow Drifts Prevented by..... 926
Fire Bucket, Misuse Prevented by Sign on..... 931
Furnace, Don'ts for..... 934
Furniture, Antique Mahogany Finish for..... 933
Garage, Folding Doors for..... 932
Gauge, Pressure, Tire Spreader Used as..... 926
Grinder, Fixture Changes Shaper to..... 927


[Contents Continued on Page 6]

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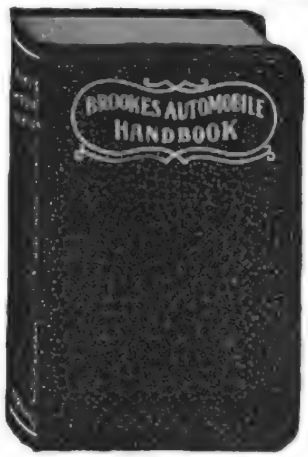


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## (Contents—Continued from Page 4)


Guards, Saw and Ax Protected by ..... 936
Hammer, Soft Metal, Handle for ..... 937
Hasp, Strap Hinge Used as ..... 941
Hooks Used on Chute, Springs Support ..... 941
Kits, First Aid, for Mechanic ..... 935
Lamp, Draftsman's, Bracket for ..... 941
Lathe Dog, Work Held by Notches in ..... 934
Lathe Tool, Multiple Purpose ..... 931
Number, Mixed, How to Divide by Two ..... 938
Oilcan, Flexible Spout on ..... 933
Pipe, High Pressure, Repair for ..... 931
Post Tamper of Pipe Fittings ..... 936
Poultry House, Extra Light for ..... 926
Poultry House, Ventilation for ..... 932
Printers' Rollers, How to Make ..... 936
Punch, Hand, Hinge Forms Die for Use with ..... 942
Radiator, Ventilator Built Behind ..... 925
Razor Blade, Scraper Made from ..... 925
Saw Frame, Endless Chain Elevator on ..... 933
Saw Rack, Clothespins Used to Make ..... 939
Shaft, Worn, Welding Builds Up ..... 942
Sign, Electric Fan Displays ..... 941
Sprayer, Gasoline, Metal Parts Cleaned by ..... 940
Spur for Walking on Ice ..... 926
Stairway for Attic, Disappearing ..... 940
Tanks, Concrete, Iron Band Protects Edges of ..... 942
Tongs for Hardening Round Dies ..... 932
Trace, Wagon, Scrap Iron Used to Repair ..... 940
Trees, Christmas, Hauling ..... 932
Truck, Collapsible, Trunks Moved on ..... 930
Tubing, Steel, Removing Scale from ..... 937
Typewriter, Compressed Air Used to Clean ..... 937
Vise, Doors for Planing Held in ..... 934
Water Pipes, Potash Used to Clean ..... 924
Wheelbarrow, Whiskey Barrel Used as ..... 930
Whetstone, Sandpaper Holds ..... 934
Whistle Valve, Method for Closing ..... 924
Window Panes, Cushion Mounting for ..... 927
Window Stop, Butt Hinge Used as ..... 937


### AMATEUR MECHANICS


Automobile—Speedster Seats, Chairs Used to Make 953
Blocks, Toy, Cement Used to Make ..... 954
Broom Holder, Bent Wire Used as ..... 953
Charcoal Sticks, How to Make ..... 946
Chicken Feeder, Tin Can Used to Make ..... 955
Coconut, Vase Made from ..... 950
Cups, Paper, Wire Stand for ..... 959
Egg, How to Put in Bottle ..... 956
Emery Cloth, Typewriter Platen Smoothed with ... 953
Engine, Electric, Twin Cylinder Model for ..... 948
File, Combination Tool Made from ..... 959
Film, Erasing Shield from ..... 959
Film, Fire Kindled with ..... 949
Fireworks—Chemical Fire Fountain ..... 950
Flowers, Paper Shelters for ..... 951
Food Chopper, Trough for ..... 953
Garden, Toy, Real Plants Used in ..... 946
Golf, Indoor, How to Make Holes for ..... 947
Gun—Shooting Downward, Why Difficult ..... 954
Heel Slipping, Corks Prevent ..... 959
Hinge, Sheet Metal and Wire Make ..... 951
Hobbyhorse, Trotting ..... 943
Measuring Scale, Body Dimensions Used as ..... 952
Moonlight, Artificial, How to Make ..... 958
Motor, Electric, Yarn Wound by ..... 949
Motorcyclist, Face Protector for ..... 944
Needle and Thread, Holder for ..... 950
Negatives, Uneven, Printing Up ..... 956
Oven, Warming, on Furnace ..... 945
Paint on Metal, Burning Oiled Paper Loosens ..... 953
Photography—High Capacity Print Drier ..... 955
Pipe Stem, Tobacco, Tightening ..... 957
Radiator Leaks, Rubber Tubing for ..... 945
Raincoat for Cyclist, Attachments for ..... 959
Scraper, Foot, Scrap Iron Used to Make ..... 955
Shovel, Snow, Fulcrum Attachment for ..... 957
Sled, Motorcycle Used to Propel ..... 947
Snow Shoes, Tin Can Used to Make ..... 950
Strap, Skate, Soft Pads on ..... 944
Switch, Relay, Mercury Contact for ..... 958
Table and Chair Combined for Child's Use ..... 952
Table, Extension for ..... 957
Tabulator, Billing Machine and Typewriter Equipped with ..... 951
Telephone Receiver Connector, Multiple ..... 951
Toy Machine Gun, Spring Operated ..... 956
Trap, Good, How to Tell ..... 944
Trick—Circle, Dot in ..... 957
Trick, Rule and Hammer ..... 956
Tube, Inner, Bandage Cover Made of ..... 955
Typewriter, Method for Silencing ..... 946
Wainscoting, Matting Used to Make ..... 945
Walks, Cement, Nails Hold Together ..... 951


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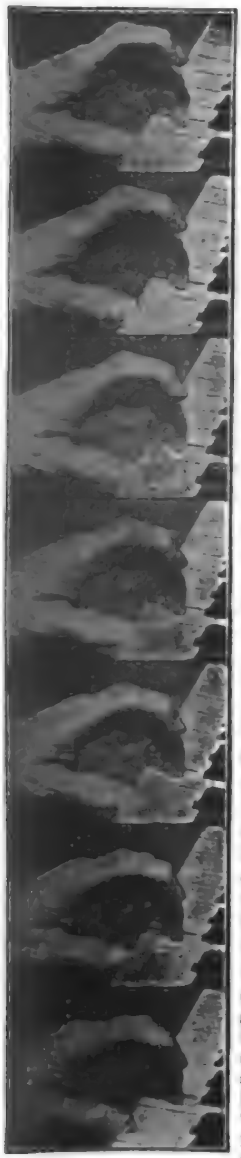
# I'll Teach You Piano In Quarter Usual Time

**To persons who have not previously heard of my method, this may seem a pretty bold statement. But I will gladly convince you of its accuracy by referring you to any number of my graduates in any part of the world.**



There isn't a State in the Union that doesn't contain a score or more skilled players of the piano or organ who obtained their *entire* training from me *by mail.* I have far more students than were ever before taught by one man. Investigate by writing for my 64-page free booklet, "How to Learn Piano or Organ."

My way of teaching piano or organ is *entirely different* from all others. Out of every four hours of study, one hour is spent *entirely away from the keyboard* — learning something about Harmony and The Laws of Music. This is an awful shock to most teachers of the "old school," who still think that learning piano is solely a problem of "finger gymnastics." When you *do* go to the keyboard, you accomplish *twice as much,* because you *understand what you are doing.* Within four lessons I enable you to play an interesting piece not only in the original key, but in all other keys as well.

I make use of every possible scientific help—many of which are *entirely unknown* to the average teacher. My patented invention, the COLOROTONE, sweeps away playing difficulties that have troubled students for generations. By its use, Transposition—usually a "night-mare" to students—becomes easy and fascinating. With my fifth lesson I introduce another important and exclusive invention, QUINN-DEX. Quinn-Dex is a simple, hand-operated moving picture device, which enables you to see, right before your eyes, every movement of my hands at the keyboard. You actually see the fingers move. Instead of having to reproduce your teacher's finger movements from MEMORY—which cannot be always accurate—you have the correct models before you during every minute of practice. The COLOROTONE and QUINN-DEX save you months and years of wasted effort. They can be obtained only from me and there is nothing else, anywhere, even remotely like them.

[Men and women who have failed by all other methods have quickly

*DR. QUINN AT HIS PIANO—From the famous sketch by Schneider, exhibited at the St. Louis Exposition.*

and easily attained success when studying with me. In all *essential* ways you are in closer touch with me than if you were studying by the oral method — yet my lessons cost you only 43 cents each — and they include all the many recent developments in scientific teaching. For the student of moderate means, this method of studying is *far superior* to all others, and even for the wealthiest student there is nothing *better* at *any* price. You may be certain that your progress is at all times in accord with the best musical thought of the present day, *and this makes all the difference in the world.*

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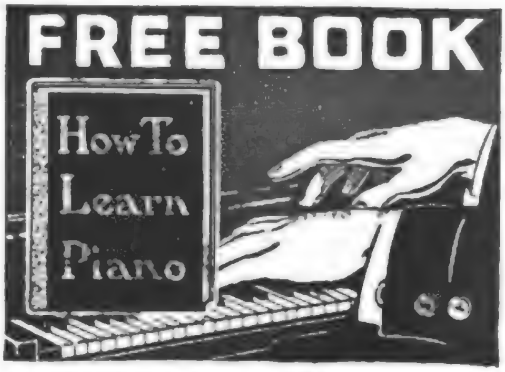


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*"I was astounded at my new power over men and women. People actually went out of their way to do things for me . . . they seemed EAGER TO PLEASE ME"*

# The Secret of Making People Like You

**"Getting people to like you is the quick road to success; it's more important than ability," says this man. It surely did wonders for him. How he does it—a simple method which anyone can use instantly.**

ALL the office was talking about it, and we were wondering which one of us would be the lucky man.

There was an important job to be filled—as Assistant-to-the-President. According to the general run of salaries in the office, this one would easily pay from $7,000 to $10,000 a year.

The main requisite, as we understood it, was striking personality and the ability to meet even the biggest men in their offices, their clubs and their homes on a basis of absolute equality. This the firm considered of even more importance than knowledge of the business.

You know just what happens when news of this sort gets around an office. The boys got to picking the man among themselves. They had the choice all narrowed down to two men—Harrison and myself. That was the way I felt about it, too. Harrison was big enough for the job, and could undoubtedly make a success of it. But, personally, I felt that I had the edge on him in lots of ways. And I was sure that the firm knew it, too.

Never shall I forget my thrill of pleasure when the president's secretary came into my office with a cheery smile, looked at me meaningly, handed me a bulletin and said, "Mr. Frazer, here is the news about the new Assistant-to-the-President." There seemed to be a new note of added respect in her attitude toward me. I smiled my appreciation as she left my desk.

At last I had come into my own! Never did the sun shine so brightly as on that morning, and never did it seem so good to be alive! These were my thoughts as I gazed out of the window, seeing not the hurrying throngs, but vivid pictures of my new position flashing before me. And then for a further joyous thrill I read the bulletin. It said, "Effective January 1, Mr. Henry J. Peters, of our Cleveland office, will assume the duties of Assistant-to-the-President at the home office."

PETERS! Peters!—surely it *couldn't* be Peters! why, this fellow Peters was only a branch-office salesman . . . *Personality!* Why, he was only five feet four inches high, and had no more personality than a mouse. Stack him up against a big man and he'd look and act like an office boy. I knew Peters well and there was nothing in him, nothing at all.

January the first came and Peters assumed his new duties. All the boys were openly hostile to him. Naturally, I felt very keenly about it, and didn't exactly go out of my way to make things pleasant for him—not exactly!

But our opposition didn't seem to bother Peters. He went right on with his work and began to make good. Soon I noticed that, despite my feeling against him, I was secretly beginning to admire him. He was winning over the other boys, too. It wasn't long before we all buried our little hatchets and palled up with Peters.

The funny thing about it was the big hit he made with the people we did business with. I never saw anything like it. They would come in

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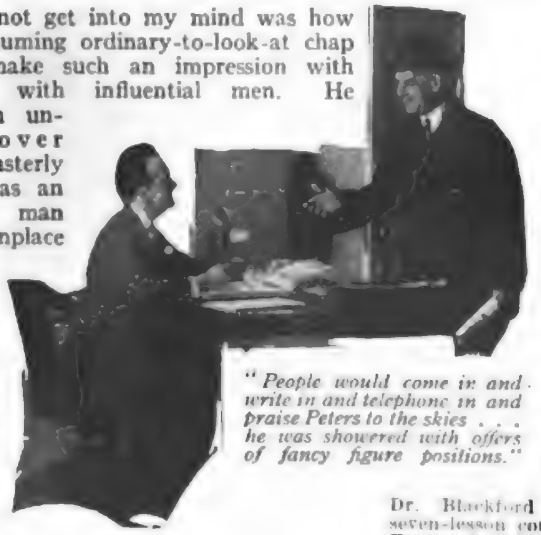
and write in and telephone in to the firm and praise Peters to the skies. They insisted on doing business with him, and gave him orders of a size that made us dizzy to look at. And offers of positions!—why, Peters had almost as many fancy-figure positions offered to him as a dictionary has words.

WHAT I could not get into my mind was how a little, unassuming ordinary-to-look-at chap like Peters could make such an impression with everyone—especially with influential men. He seemed to have an uncanny influence over people. The masterly Peters of to-day was an altogether different man from the commonplace Peters I had first met years ago. I could not figure it out, nor could the other boys.



*"People would come in and write in and telephone in and praise Peters to the skies . . . he was showered with offers of fancy figure positions."*

One day at luncheon I came right out and asked Peters how he did it. I half expected him to evade. But he didn't. He let me in on the secret. He said he was not afraid to do it because there was always plenty of room at the top.

What Peters told me acted on my mind in exactly the same way as when you stand on a hill and look through binocular glasses at objects in the far distance. Many things I could not see before suddenly leaped into my mind with startling clearness. A new sense of power surged through me. And I felt the urge to put it into action.

Within a month I was getting remarkable results. *I had suddenly become popular.* Business men of importance who had formerly given me only a passing nod of acquaintance, suddenly showed a desire for my friendship. I was invited into the most select social circles. People—even strangers—actually went out of their way to do things for me. At first I was astounded at my new power over men and women. Not only could I get them to do what I wanted them to do, but they actually anticipated my wishes and seemed eager to *please me.*

I COULD tell you dozens of similar instances, but they all tell the same story—the ability to make people like you, believe what you want them to believe, and to do what you want them to do. I take no personal credit for what I have done. All the credit I give to the method Peters told me about. We have told it to lots of our friends, and it has enabled them to do just as remarkable things as Peters and I have done.

Which reminds me: One of my wife's dose friends moved to another town where she was a stranger. My wife of course knew of my method. She told it to her friend with the idea that it might be of assistance to her in meeting new people. It helped her so wonderfully that in a very short time she won the close friendship of many of the "best families" in the town. Everyone wonders how she did it. But WE know.

WHAT Peters told me at luncheon that day was this: "Get Dr. Blackford's 'Reading Character at Sight.'" I did so. This is how I learned to do all the remarkable things I have told you about.

You have heard of Dr. Blackford the Master Character Analyst. Many concerns will not employ a man without first getting Dr. Blackford to pass on him. Concerns such as Westinghouse Electric and Manufacturing Company, Baker-Vawter Company, Scott Paper Company, and many others pay Dr. Blackford large annual fees for advice on dealing with human nature.

So great was the demand for these services that Dr. Blackford could not even begin to fill all the engagements. So Dr. Blackford has explained the method in a simple seven-lesson course entitled "Reading Character at Sight." Even a half hour's reading of this remarkable course will give you an insight into human nature and a power over people which will surprise you.

Such confidence have the publishers in Dr. Blackford's Course, "Reading Character at Sight," that they will gladly send it to you on approval. Send no money. Merely fill in and mail the coupon. The complete course will go to you instantly, on approval, all charges prepaid. Look it over thoroughly. See if it lives up to the claims made for it. If you do not want to keep it, then return it, and the transaction is closed. And if you decide to keep it—as you surely will—then merely remit Five Dollars in full parment.

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*"In a very short time she won the close friendship of many of the 'best families' in town"*

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# *Five Days to Prove I Can Raise Your Pay*

## I've done it for thousands of others. I can doubtless do it for you. If I can't, then it won't cost you a cent

I MEAN just what I say. There's no trick or catch about it. Give me five days and I'll prove that I can get your pay raised for you. I'll do it on a "show you" basis. You get the proof before you pay me a cent.

You've probably heard of me. My name is Pelton. Lots of people call me "The Man Who Makes Men Rich." I don't deny it. I've done it for thousands of people—lifted them up from poverty to riches. There's no sound reason why I cannot do it for you. So let's try.

Now, follow me carefully. I'm going to tell you exactly how to do it. I'm the possessor of a "secret" for which men have been searching since Time began.

There's no need to discuss the whys and the wherefores of this "secret." Suffice it to say that *It Works*. That's all we care about—*It Works*. Over 350,000 men and women the world over have proved it for themselves.

Among them are such men as Judge Ben B. Lindsay; Supreme Court Justice Parker; Lieut. Governor McKelvie of Nebraska; Wu Ting Fang, ex-U. S. Chinese Ambassador; Governor Ferris of Michigan, and thousands of others of equal prominence.

Some of the things this "secret" has done for people are astounding. I would hardly believe them if I hadn't seen them with my own eyes. Adding ten, twenty, thirty or forty dollars a week to a man's income is a mere nothing. That's merely playing at it. Listen to this:

A young man in the East had an article for which there was a nation-wide demand. For twelve years he "puttered around" with it—barely eking out a living. Today this young man is worth $200,000. He is building a $25,000 home—and paying cash for it. He has three automobiles. His children go to private schools. He goes hunting, fishing, traveling whenever the mood strikes him. His income is over a thousand dollars a week.

In a little town in New York lives a man who two years ago was pitied by all who knew him. From the time he was 14 he had worked and slaved—and at sixty he was looked upon as a failure. Without work, in debt to his charitable friends, with an invalid son to support, the outlook was pitchy black.

Then he learned the "secret." In two weeks he was in business for himself. In three months his plant was working night and day to fill orders. During 1916 the profits were $20,000. During 1917 the profits ran close to $40,000. And this genial 64-year-young man is enjoying pleasures and comforts he little dreamed would ever be his.

I could tell you thousands of similar instances. But there's no need to do this as I'm willing to tell you the "secret" itself. Then you can



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put it to work and see what it will do for you. I don't claim I can make you rich over night. Maybe I can—maybe I can't. Sometimes I have failures—everyone has. But I do claim that I can help 90 out of every 100 people if they will let me.

The point of it all, my friend, is that you are using only about one-tenth of that wonderful brain of yours. That's why you haven't won greater success. Throw the unused nine-tenths of your brain into action and you'll be amazed at the almost instantaneous results.

The Will is the motive power of the brain. Without a highly trained, inflexible will, a man has about as much chance of attaining success in life as a railway engine has of crossing the continent without steam. The biggest ideas have no value without will-power to "put them over." Yet the will, although heretofore entirely neglected, can be trained into wonderful power like the brain or memory and by the very same method—intelligent exercise and use.

If you held your arm in a sling for two years, it would become powerless to lift a feather, from lack of use. The same is true of the Will—it becomes useless from lack of practice. Because we don't use our Wills—because we continually bow to circumstance—we become unable to assert ourselves. What our wills need is practice.

Develop your will-power and money will flow in on you. Rich opportunities will open up for you. Driving energy you never dreamed you had will manifest itself. You will thrill with a new power—a power that nothing can resist. You'll have an influence over people that you never thought possible. Success—in whatever form you want it—will come as easy as failure came before. And those are only a few of the things the "secret" will do for you. The "secret" is fully explained in the wonderful book "Power of Will."

## A Few Examples

**Personal Experiences**

Among over 350,000 users of "Power of Will" are such men as Judge Ben B. Lindsay; Supreme Court Justice Parker; Wu Ting Fang, Ex. U. S. Chinese Ambassador; Assistant Postmaster General Britt; Lieut. Gov. McKelvie of Nebraska; General Manager Christeson of Wells-Fargo Express Co.; E. St. Elmo Lewis of Detroit; Gov. Ferris of Michigan, and many others of equal prominence.

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But if you do feel that "POWER OF WILL" will do for you what it has done for over a quarter of a million others—if you feel as they do that it's the next greatest book to the Bible—send me only $3.50 and you and I'll be square.

If you pass this offer by, I'll be out only the small profit on a three and a half-dollar sale. But you—you may easily be out the difference between what you're making now and an income several times as great. So you see you've a lot—a whole lot—more to lose than I.

Mail the coupon or write a letter now—you may never read this offer again.

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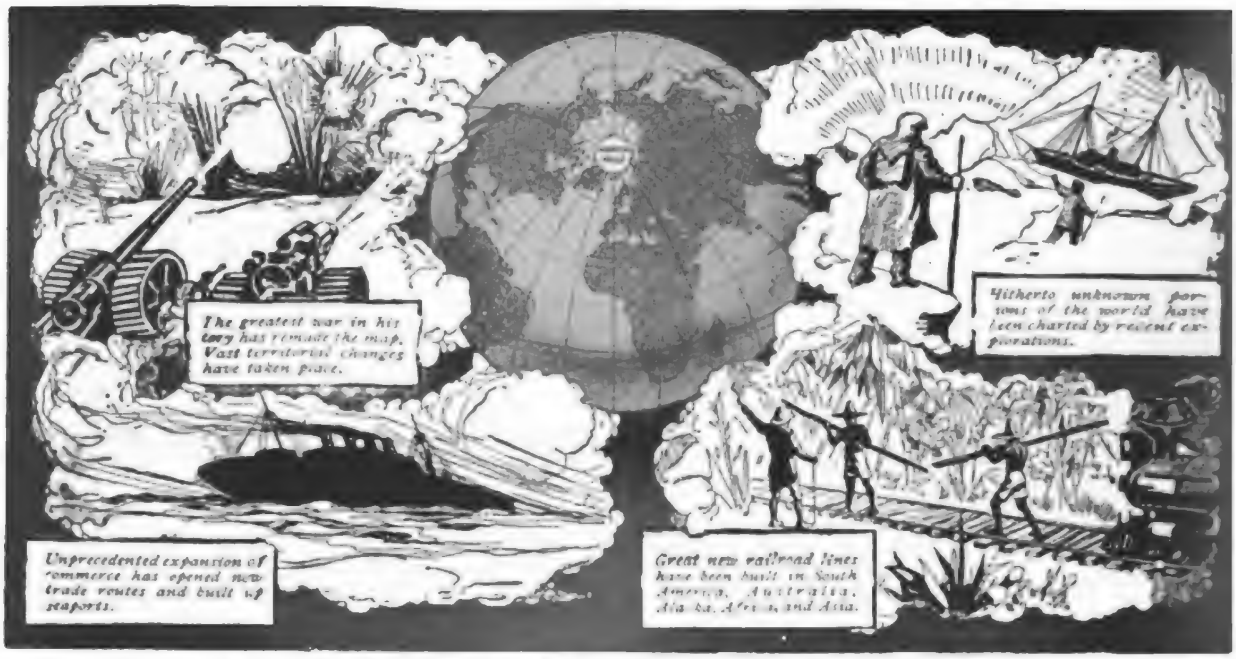


# A NEW World You Have Never Seen!

HAVE you seen the world as it looks today? The old world no longer exists—it has been completely made over—vast changes have taken place in every quarter of the globe. Today we are living in a NEW world!

The greatest war in history has turned the whole world upside down. It has wiped out our former maps—it has altered the face of continents, changed the status of territories everywhere—it has upset the entire world situation.

**Important New Changes Everywhere**

Besides the war, there have been other epoch-making forces at work revising the map of the world. Recent explorations, unprecedented expansion in commerce and industry, political upheavals—all have left their marks in every part of the globe.

How much do you know of this New World you are living in? Probably you have seen fragmentary maps in newspapers and magazines showing some one portion of the map that has been affected, but have you ever had the whole new world of today laid before your eyes so that you get a clear, comprehensive conception of just what changes have taken place?

Do you know what has been added to our geographical knowledge of the world by the recent explorations of Stefansson, Stuck, and McMillan in the Arctic, of Smuts in Africa, of Roosevelt and Rondo in Brazil?

Do you know how commerce has opened new routes of communication, built great new railroads in Alaska, Australia, Africa, Asia, South America?

Do you know how many new industrial cities have sprung up as a result of shipbuilding in the United States?

Do you know where the new kingdom of Hejaz and the new empire of Mongolia are located?

Do you know the new Europe that has come out of the war—with all the changes in boundaries, the new nations that have been born, the internationalized cities, the territories that are under plebiscites?

Do you know how the Peace Treaties have affected Africa, Asia, the islands of the Pacific?

Do you know what is included in the territory of over a million square miles which was taken from Germany and how it was disposed of by the Allies?

## The New Strap on Italy's Boot

THERE is a new strap on Italy's boot as a result of the war. The northern boundary has been extended to strengthen the natural frontier—important readjustments have been made on the Dalmatian coast. Yet your present atlas does not show these vital changes. And this is only one example of the many vast alterations that have completely changed the map of every part of the world. You might better have no atlas at all than one that is full of misinformation. But this is the last time you need ever discard an out-of-date atlas, for now a *new kind* of atlas is ready for you—The NEW WORLD Loose-Leaf ATLAS—up-to-date *now* and *always*.

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### The Whole World Re-Mapped

Abreast of this great new world order comes a new kind of atlas—an atlas that keeps pace with the world! The NEW WORLD Loose-Leaf ATLAS is now ready—a superb new collection of maps that lays before you, in great detail, the whole new world of today.

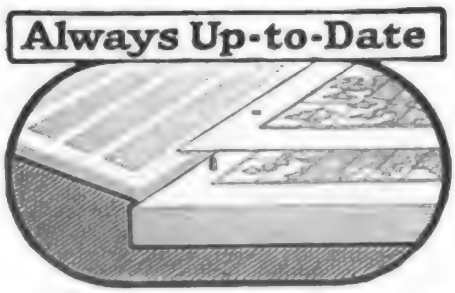
But this is more than a *new* atlas—more than an *up-to-date* atlas—it is an atlas that can be *kept* up-to-date—that shows changes in the map whenever and wherever they occur, for with this atlas is furnished up-to-date *Map Service* that keeps abreast of current events.

## A Few of the Many Features

**Three hundred and seventy-six pages of maps and indexes. All maps are printed in full color on heavy, supercalendered paper, size of page 13¼ by 19½ inches. Rich, durable cover with special Loose-Leaf Binder. New maps of all the nations, territories, and islands of the world revised to date. Detail maps of important cities and harbors. Maps of the Hemispheres and the World. Exploration maps of North and South Poles. Language map of Europe. Large-scale map of the Western Front. Sixteen pages of Historical maps showing the territorial development of the nations of the world from ancient times. A comprehensive collection of special maps, including Physical, Vegetation, Climate, Population, Economic, and Agricultural maps. Large-scale maps of the United States. United States Railroad maps and key map showing standard time zones, parcel-post units. U. S. shipbuilding map. Oil and gas map. Over one hundred pages of new State maps, showing each State on large scale and in great detail. A complete index of the world, the index of the United States including the name of every incorporated place, post office, and town of over one hundred inhabitants, with latest population figures.**

# A Wonderful New Kind of Atlas

If the world never changed, no atlas would ever grow out-of-date. But with the rapid march of current events even new atlases must soon become obsolete. The NEW WORLD Loose-Leaf Atlas is the only atlas that keeps pace with the world, because we made it

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### World to Undergo Many Changes

Even now after all the changes that have taken place in every part of the globe, an atlas cannot be kept up-to-date unless provision is made for future changes.

Plebiscites are apt to wipe out many boundary lines. Self-determination may bring about drastic changes. Perhaps even an entire continent may be divorced from its present rule. Who can foretell all that will take place in the next year or so?

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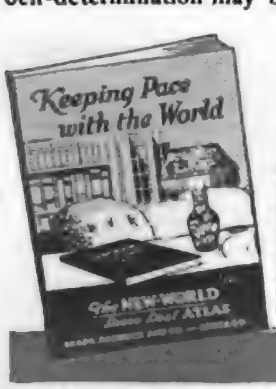


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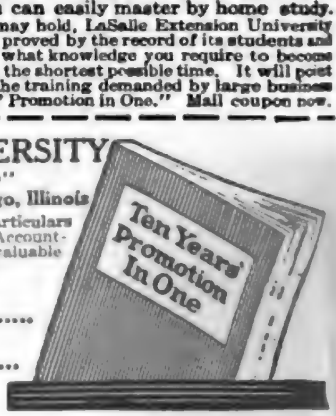


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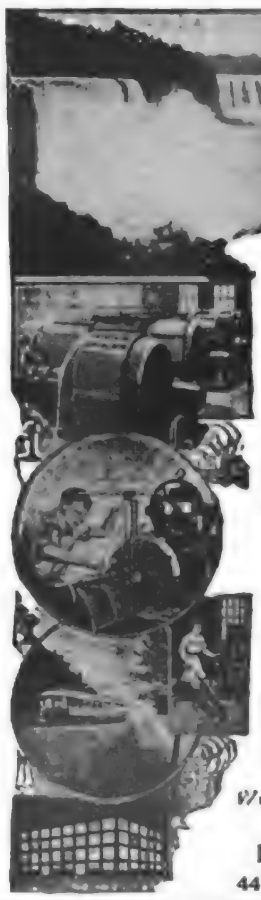

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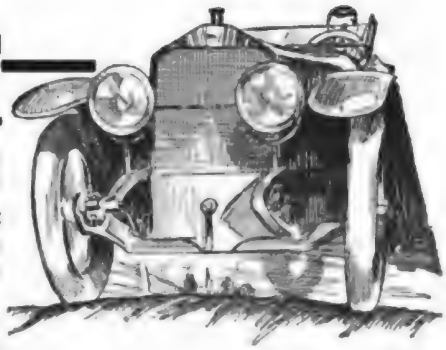

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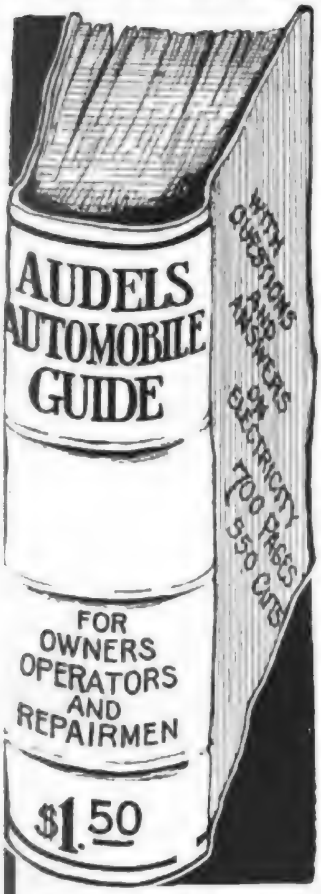


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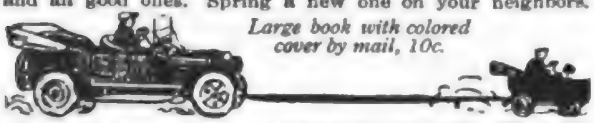

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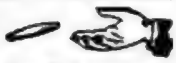
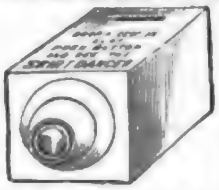


**You ask a friend if he will have a cigar. If he says yes, which is usually the case, you take what appears to be an ordinary cigar and hand it to him. As he reaches for it the cigar instantly disappears right before his eyes, much to his astonishment. You can apologize, saying you are very sorry, but it was the last cigar you had and the chances are he will invite you to smoke with him if you will let him into the secret. It is not done by sleight of hand, but the cigar actually disappears so suddenly that the eye fails to follow it. Price, mail, with instructions, 10c**



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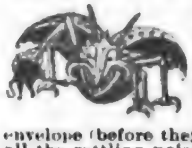

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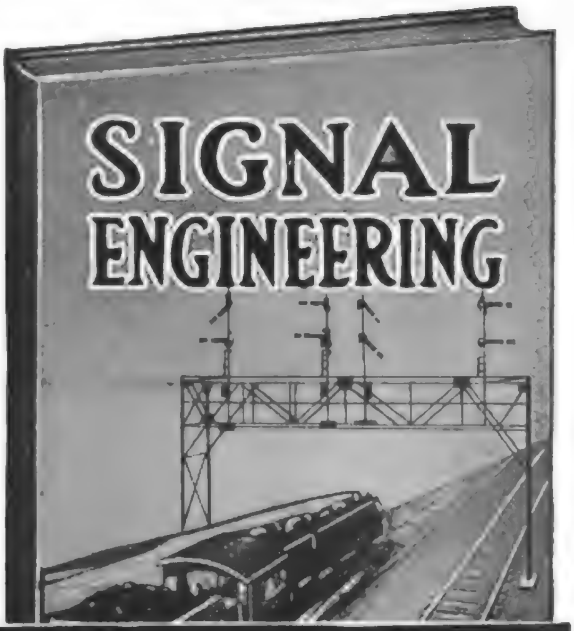


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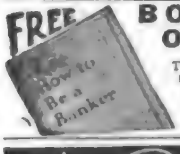


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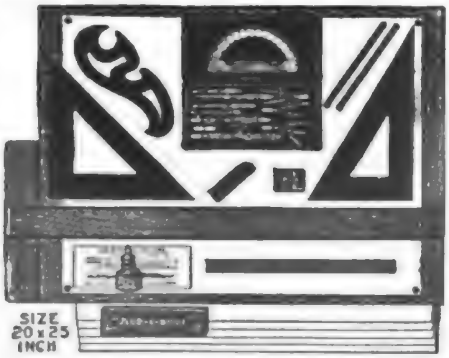


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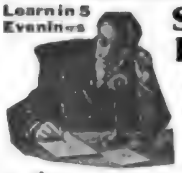

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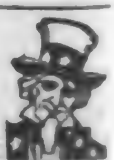

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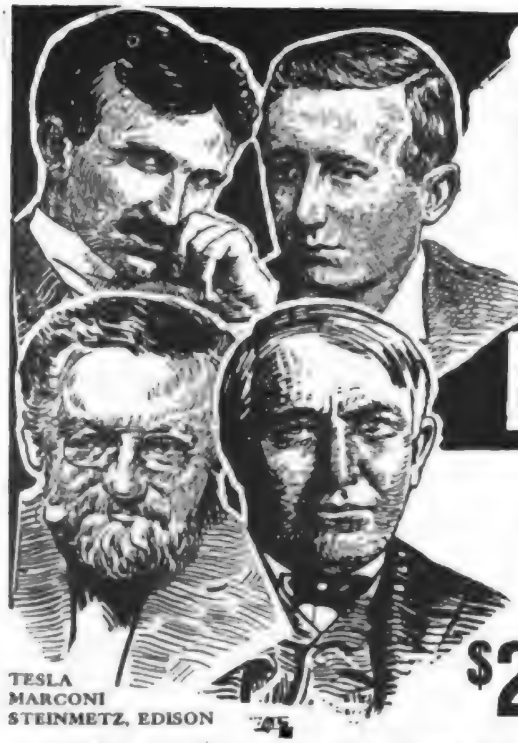

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RETREADED Tires, Guaranteed to give good service. Size 30x3, $5.00; 30x3½, $6.00; 33x4, $9.00; 34x4, $9.00; 36x4, $9.00; 36x4½, $10.00; 36x5, $11.00; 37x5, $11.00. 20% required on all C. O. D. orders. State if Q. D. straight side or clincher type. 5% discount if cash accompanies order. Also special discount to dealers. I also carry a full line of New First and Factory blemished tires and tubes at $9.00 and upwards. Tubes at $1.50 and upwards. Prices will be sent on request. Kindly state size. I. Jaffess, 1319 5th Ave., New York. Branch, 241 West 54th St., New York.

NEW Tires—The Same Mileage Guarantee. The Same Standard Make. Compare our prices and see that you are saving from 15 to 20 dollars on purchasing direct from us. 30x3 Plain $8.00, NonSkid $9.00; 30x3½ Plain $11.00, NonSkid $12.00; 32x3½ Plain $13.00, NonSkid $14.00; 31x4 Plain $14.00, NonSkid $16.50; 32x4 Plain $16.00, NonSkid $18.00; 34x4 Plain $16.50, NonSkid $18.50; 37x5 Plain $30.00, NonSkid $35.00. These and other sizes always in stock. Also a full line of guaranteed tubes. 20% deposit required on C. O. D. orders. Send in your order now and get the best selection from stock on hand. M. Liben & Co., 793B 7th Ave., New York City.

SEND for your copy of guaranteed, standard accessories and tires at money-saving prices. We guarantee to save you money. Send for the book today. David Stern Company, Value, Service, Satisfaction Since 1885, 1027F Madison St., Chicago, Ill.

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AUTO Top Roof or Seat Covers, $7 and up. Parcel post prepaid. Easy to apply. Samples of cloth free. Auto Equipment Co., 15 Canal St., Cincinnati, O.

TIRES, non-skid. Guaranteed by the factory for 6,000 miles. 30x3½, $14.25. Red tubes, $2.75. Give size. Name car. G. H. Flintham, Topeka, Kans.

DIAMOND Tires (new), 6,000 and 8,000 mile guarantee at wholesale prices. Send for price list. Zoern Tire Co., 1753 Berteau Ave., Chicago.

LUBRICANT Carbon Remover will remove the Carbon. Pour two to four tablespoonfuls into each spark plug hole and the motor will do the rest. You will see the proof in cleaned spark plugs and cylinders. Every can guaranteed. $1.00 prepaid. Write for particulars, etc. Curtis Van Wyatt, Salisbury, N. C.

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COMBINATION Spark Plug Cleaner and Gauge, Dime. Castle Syndicate, Detroit, Mich.

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SPEED Bodies for Ford cars. Best quality, bargain prices. Allied Steel Products Co., Aurora, Illinois.

EVERY Automobile and truck keeps using Nobac, after trying it and endorse it. See advertisement under Highgrade Salesmen Wanted.

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GREAT Discovery for Automobile Tops. Semi-dye for lining as well as exterior (cloth or leather) of automobile top. A waterproof semi-dye for unsightly water stained, dirty, discolored lining in auto tops. Easily applied and won't fade. Battleship grey, Black or khaki colors, etc., $1.75 a pint. Auto-Top-Dye Co., P. O. Stark, Mgr., 409 Pendery Ave., Wyoming, Ohio.

A NEW four cylinder twenty horse automobile motor for fifty dollars. Fine for shop or boat. E. Prentice, Amsterdam, N. Y.

THAT unsightly broken celluloid in your rear curtain can be replaced by real glass in beautiful metal frame. Anyone can attach. For all makes and models of cars. When ordering, give name of car, year and model. Auto Curtain Glass Co., 383 Shrewsbury St., Worcester, Mass.

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VULCANIZE on Anderson's Famous Vulcanizer. See advertisement, page 180

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"DISAPPOINTED Auto Thieves,"—Lock highly endorsed by Auto owners. Individual combination easily installed. Satisfaction wherever used. Send $5.00, name of car, type of ignition. Wm. L. Dysart, A. E., Box 603, Harlowton, Mont.

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AUTO Motors and Supplies. Buick, Hupp, Franklin, Michigan, Everett, Hudson, Chalmers, both water and air-cooled motors $40 each and up. Bosch Magnetos $15 each and up. Presto tanks, $5.00. Coils, Carburetors, Head Lamps, Horns, Air Compressors, Generators, Starters. Write for Bargain Bulletin second-hand auto accessories. Johnston, West End, Pittsburgh, Penna.

TIRES—Direct to You Prices. Exclusive representative wanted each locality to use and sell the new Mellinger Extra Ply Tires (no seconds). Guarantee Bonds 8,000 Miles. Sample Sections furnished. Mellinger Tire Company, Kansas City, Mo.

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STANLEY Steamers Exclusively, used boilers, burners, engines, automatics, gauges, piping, fittings, miscellaneous accessories. Inclose stamp for "list." "Doc" Paine, Denver, Colorado.

DETROIT Vapor carburetors increase power, pep and mileage 40 to 75%; uses all fuel readily, prevents carbon. Instant zero weather starting. Simplest, safest and best carburetor on the market and sure solution to engine troubles. Fits all cars. Absolute satisfaction guaranteed. Responsible district managers wanted. Holmes Motor Products, 1826 Dime Bank Building, Detroit, Michigan

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INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P-7, Cincinnati, O.

EXCLUSIVE County Rights. Sell Tankil; modern auto fuel. Guaranteed; 100 to 300% profit. Vapor Spray burns water. Adds tremendous power. Tankil, Cleveland, Ohio.

PATENTS—Write for our free illustrated Guide Book, "How to Obtain a Patent." Send model or sketch and description of your invention and we will give our opinion of its patentable nature. Highest references. Prompt service. Reasonable terms. Victor J. Evans & Co., 185 Ninth, Washington, D. C.

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"AF-FORD-ABLE Gas Heater" saves 25% to 40% in gasoline for Ford owners. Vaporizes perfectly all grades of gasoline. Holds the heat and puts "pep" into the motor. Wonderful cold weather gas saver. Fliers only tool required. Improves appearance. Satisfaction or Money Back guarantee. $1.50 postpaid anywhere. Get your order in now. Circular if you want it. The Affordable Co., 1154H, No. 16th St., Omaha, Nebr.

INCREASE your power, pep, miles per gallon with greatly increased cooling efficiency. Mr. Expressman—why tear your motor to pieces running in low? Make valve in head motor of your Ford. Our specially designed head—8 valves over pistons—increases power 60%. Standard Ford connections. Price $60.00. Speed Head, $85.00. Attractive dealers' proposition. Culford Engineering Wks., 17 Sprout St., Detroit, Michigan.

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STABILIZE your Ford. Make it steer like a big car by using the "Cincinnati" Stabilizer. Built better than the Car itself, can be attached with pliers or wrench. Prevents accidents, saves spindle bushings, makes the Ford drive comfortably on rough or high-crowned roads. Agents wanted. $6.00 postpaid. The Cincinnati Ball Crank Co., Cincinnati, Ohio.

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AUTOMATIC Safety trips for Fordsons $12.00. Write now for circular. Live agents wanted. Merklin & Tollefson Mfg. Co., Bonilla, So. Dak.

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INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P.-8, Cincinnati, O.

"THE Litl Shofur" safety steering device for Ford Cars, operates without coiled springs, bearings, cams, or other wearing parts. Thousands sold and only $3 each. Agents wanted everywhere. Powel Crosley, Jr., Sta. A, Cincinnati, Ohio.

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WE specialize in Harley-Davidson parts and accessories to fit. 28x3 brand-new Goodrich casings, guaranteed for 6,000 miles, $12.00. Two-piece corduroy riding suits. Norfolk coat and laced bottom trousers, $15.00, while they last. State waist and chest measurement. Mail stamp for parts book and circular of used machines of all makes and models. We pay the war tax and prepay parcel post shipment. During the winter months we will repair your motorcycle at reduced prices and pay one-way transportation. Liberty Bonds accepted at full face value on all machines purchased. Wisconsin Cycle Sales Co., 726-730 National Ave., Milwaukee, Wisconsin.

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BICYCLES, $10 up. Tandems (bicycles built for two), bargains, $15 up. List free. McDougald, 300 N. Wells, Chicago, Ills.

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MOTORCYCLE cylinders reground, fitted with new piston and rings, $6.00, guaranteed. Muncie Piston Co., Muncie, Ind.

$25.00 UP, guaranteed rebuilt motorcycles Henderson, Excelsior, Indian, Harley-Davidson. Bicycles, $5.00 up. Tires and accessories at wholesale. Illustrated bulletin A free. Ash Motor Corporation, 162 N. Clinton Ave., Rochester, N. Y.

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A LIGHT welding and lead-burning torch combined, built on the most scientific principles. Price $7.00 delivered. Also acetylene brazing and soldering torch, nickel-plated, fiber handle, finest torch built, price $1.50 delivered. We duplicate parts for any make of torch. Marshall Mfg. Co., 1209 Grand Ave., Kansas City, Mo.

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WELDING Plants $30.00 to $300.00. Designed for all purposes, small cash payment, balance three to six months. Every mechanic or shop should have one. Write Bermo Co., Omaha, U. S. A.

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BUILD a Star Jr. Biplane—Plan $2.00. Or send $3.75 for plan and Rathbun's "Aeroplane Construction and Operation." Chicago Aero Works, River Street, Chicago.

HEATH propellers represent the experience of 10 years' intensive propeller manufacture. Most efficient and durable in the long run. For land, air and water propulsion. Special Discount. Get propeller catalogue 4c in stamps. Heath Airplane Co., Chicago.

BARGAIN Prices; DeHaviland Struts, Spars, Longerons, Woodparts to your dimensions. Light Tractors and parts built to order. Write L. H. DeRemer, Bay City, Michigan.

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PARACHUTES for Aviators; standard equipment. Thompson Balloon Co., Aurora, Illinois.

BUILD the Marinette Monoplane and Biplane; use motorcycle engine. Stamp for particulars. M. Meyler, 218 East Main St., Kalamazoo, Mich.

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COMPLETE set of drawings of the Liberty 12 Engine. A United States Standardized Aircraft Engine. Giving all views with number of parts, names of parts and weights of parts. Mail $1.00. Ocean Publishing Co., 25 W. 42nd St., New York City.

THE American School of Aviation announces a new correspondence course in Mechanics of Aviation. A thorough training in Practical Aeronautics. American School of Aviation, Dept. 1879, 431 S. Dearborn St., Chicago, Ill.

BUILD the "Simmons Biplane," flies with motorcycle engine. Drawings and description, $1.00. Wasson Laurence, Fairfield, Ill.

BIPLANES and Monoplanes. Motorcycle motor used. Anyone with a few tools can build and fly one successfully. Blue Prints, Biplane, $6.00; Monoplane, $3.50. Tafts Garage, R. F. D. No. 1, Athol, Mass.

U. S. NAVY offers for sale Seaplanes, Engines and Spares. See page 176, advertising section.

MODEL Aeroplane. Has two propellers. Parts complete, 75c. Circular free. Toy Shop, 561 Sheridan Ave., Detroit, Mich.

LEARN flying. Build your own aeroplane, we furnish Knock Down parts for successful motorcycle engined biplane on installments. Plans free. Aeronautical supplies. Irwin Aircraft Co., 1220 Yale St., Sacramento, Cal.

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AGENTS—Here is $50.00 to $200.00 weekly proposition. Permanent and repeat. Every office and home needs Argus Moistener for moistening stamps and envelopes. Argus paper clips and pencil and fountain pen holders sell to every man you show—they are different and better than any on the market. Write for particulars. Argus Mfg. Co., 406 No. Paulina St., Dept. 14-C, Chicago.

START in a permanent business of your own, selling guaranteed Hosiery and Underwear direct from mills. No capital or experience needed; many representatives make $3,000 to $5,000 per year. Become our district manager—get others working for you. Write for details to Mallech Knitting Mills, 5912 Grant St., Grand Rapids, Mich.

CONNECT with real money-makers: 300 specialty manufacturers advertise in Specialty Salesman Magazine. 300 Safe propositions to select from. Chuck full inspirational selling talks by best salesmanship writers. Exposes frauds, forces square deal. 100 pages. $2.00 yearly, three months' trial, 25c. Read current issue: if not satisfied, money refunded. Robert Hicks, 915 Caxton Building, Chicago.

TIRE Insoles—prevent punctures and blowouts. Mileage increased 100%. Anyone can apply in few minutes—low price. Enormous demand. Large profits. Particulars free. Insole Tire Corporation, Dept. H, 221 E. Third, Cincinnati.

**KLEAN-RITE** Laundry Tablets — Washes clothes spotlessly clean without rubbing. Contains no injurious chemicals; Best Washing Tablet made. Positively the wonder of the age. "Pays Agents largest profit." We supply free samples and guarantee sale of every package you buy. You take no risk. Our free samples help you sell to every housewife you call on. Outfit free to workers. We have the best proposition ever offered to an Agent. Write immediately for sample and Special Offer. Bestever Products Co., 12-KK, 3253 Belleplaine, Chicago.

**AGENTS'** Unusual Business Opportunity! Automobile accessory of assured merit immediately recognized upon presentation. This is an interesting and profitable line for the man who can intelligently present an accessory of proven demand to the automobile owner. Handsome returns quickly and easily obtained for the small financial requirement necessary to secure exclusive selling rights. Let us tell you about this attractive proposition. The Emo Laboratories, 2255 N. Illinois St., Indianapolis, Ind.

**MEN** and Women Agents to take orders for our high-grade extracts, spices, perfumes, soaps, toilet preparations, remedies, teas, coffees and food specialties on "factory to home" plan. All or part time work. Ready welcome from customers because you actually give them double value. Makes easy sales, good profits and repeat business. When you make good we have something still better for you. Write The Lange Co., De Pere, Wis.

**PHOTO** Pillow Tops, Portraits, Frames, Sheet Pictures, Medallions, Patriotic Pictures, Pennants, War Books. Prompt shipments; samples and Catalogues free to agents; 30 days' credit. Jas. C. Bailey Co., Desk C-2, Chicago.

**BIGGEST** Money-Maker in America. I want 100 men and women quick to take orders for raincoats, raincapes and waterproof aprons. Thousands of orders waiting for you. $2.00 an hour for spare time. Maher made $597.50 in June. Nisson $19 in three hours. Purviance $207.00 in seven days. $2,500 a year profit for four average orders a day. No delivering or collecting. Beautiful coat free. No experience or capital required. Write quick for information. Comer Mfg. Co., Dept. U-117, Dayton, Ohio.

**AGENTS** earning $20 daily; new Ford lock; thief proof; sells $1. Also 50 other exclusive inventions. Agent's outfit and sample Free. Inventors Assn., 110 St. Louis.

**EARN** $100 weekly—District Manager—new line of specialties. No capital needed. Sell to consumer and dealer. Big profit. Easily sold. Goerke, Manitou, Colo.

**GOLD** transfer letters for automobiles, trunks, suitcases, handbags, $10 to $15 a day lettering autos. Write for plan and general agents' offer. Samples free. Decalco Co., 306 Clinton Bldg., Newark, N. J.

**AGENTS:** Wireless umbrella. Something brand new. Costs no more than ordinary kind. Biggest seller ever introduced. Write quick for agency. Parker Mfg. Co., 178 Dike St., Dayton, Ohio.

**AGENTS:** Automobile necessity—Wundr Carbon Remover—most efficient on market: cleans engine in 15 minutes. Big profit—Agent's set of four—60 cents. Write quick for proposition. Dept. C., Munger Products Company, 220 Fifth Avenue, New York City.

**SELL** Necessities. Everybody needs and buys the "Business Guide." Bryant cleared $800.00 in July. Send for sample. It's Free. Nichols Co., Box 4-B, Naperville, Ill.

**AGENTS:** Reversible raincoat. Not sold in stores. Two coats in one. Something brand new. Saves price of expensive overcoat. Guaranteed waterproof or money back. Big seller. Emil Thor made $134 in one week. We manufacture and make to measure. No capital required. Sample furnished. Parker Mfg. Co., 678 Rue St., Dayton, Ohio.

**BUILD** a genuine Choraleon Phonograph and save over half. Fine profits building and selling. We furnish motors, tone-arms and necessary parts. Send for our catalog and free blueprint offer. Choraleon Phonograph Co., 1222 Monger Bldg., Elkhart, Ind.

**AGENTS:** Big profits selling our New $3.50 Automatic Adding Machine. Quick sales. Ten daily easy. No competition. Anyone having adding to do is positive customer. You'll be glad you wrote us. Bassett Company, 1458-K, Hollywood Ave., Chicago.

**SALESMEN**—Become independent — own your business, experience unnecessary—selling our $6,000 Accident, Death, $30.00 Accident, $25.00 Sick Weekly Benefits, $10.50 yearly, half amounts, $5.50. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. P, Newark, N. J.

**AGENTS**—Snappiest Household Line on earth. Red-hot sellers, steady repeaters—100% profit. 500 light-weight, fast-selling, popular-priced necessities. Agents outfit free. Get busy—quick. Write today; postal will do. American Products Co., 1436 American Bldg., Cincinnati, O.

**AGENTS**, $60 weekly introducing and selling new 300 Candle-Power Coal-oil Burner Lamp. Dazzling light. Can't explode. No wick, no chimney. Odorless, smokeless. Write for terms and sample. Thomas Mfg. Co., 2762 North St., Dayton, Ohio.

**AGENTS**—Here's a whirlwind seller. America's greatest game "Base Ball." New, exciting, interesting. Everyone plays. Sells on sight. Wonderful Christmas article. Sample only 25c. Write now, today. A. L. Smith, Room 304, 1482 Broadway, New York.

**AGENTS**—Every wise salesman wants a repeater proposition. We have it and it's worth $75-$100 a week. Specialty Mfg. Company, Division 250, Madison, Wis.

**WONDERFUL** Comb Cleaner. Sensational Sport Camera 100% moneymakers. Sample 35c, both 50c. Interesting mail-order newspaper 10c. Illustrated Clipper, Philadelphia, Pa.

**AGENTS**—"Handy Gloss" Keeps your windshields and windows free from frost and moisture. Handy Gloss is a chemically prepared paper cloth, put up in handy booklet form. One sheet for one application and then it may be thrown away. For motorist, storekeeper and housewife. A year's supply in one book. Write for sample and particulars. Essex Specialty Paper Co., Everett, Mass.

**AGENTS:** Reversible raincoat. Biggest seller ever introduced. Something new. Latest style. Not sold in stores. Guaranteed waterproof. Two coats for the price of one. No capital required. We deliver and collect. Write for territory and sample. Thomas Raincoat Co., 1462 North St., Dayton, Ohio.

**THE** National Honor Ring and Tablet is the latest sensation and marvelous invention. Soldiers, Sailors of the World War—Relatives, Friends—write for circular. A gold mine for Agents for 'Xmas. Nat. Honor Ring & Tablet Bureau, 166 Chelsea St., Charlestown, Mass.

**AGENTS!** Quick Sales! Big profits! Anyone can sell our hand-painted holiday signs to stores. 2 samples 15c; catalog free. Challenge Sign Works, 298 Broadway, New York City.

**AGENTS**—We want live men to represent us in your locality; big opportunities for right parties. Nu-Tred Tire Co., Columbiana, O.

**AGENTS** handle Anti-Bleeding-Cotton. Guaranteed. Repeater. Write us today. Galvo, 1386 East 40th St., Cleveland, Ohio.

**YOUR** Chance to make big money easily and steadily. Men, women, boys and girls. All or spare time. Wonderful self-selling plan. Unlike peddling and canvassing. No experience or special training required. Full particulars and samples valued at $1.50 sent prepaid for 15 cents. Velvo Company, Dept. 1, Jackson, Mich.

**THE** Best Fire Extinguisher Made—The $1 Carbona Fire Extinguisher smothers in a second any kind of fire. An absolute necessity in every home, store, office, factory, school, public building. The only extinguisher a child can work. As good in every way as any $15 to $100 extinguisher. Agents are selling five to a dozen in every home and business place. Write for particulars at once or send $1 for full size outfit. Carbona Products Co., 304 West 26th St., New York City.

**AGENTS** make $50 weekly selling Accident and Sickness Policies for $10 yearly. Pays $5,000 death, increasing to $7,500. Also $25 weekly benefit for accident or sickness. Quick claim settlements. Permanent income from renewals. $100,000 deposited with State. Address Insurance Co., Dept. K-1, Newark, N. J.

**AUTOMATIC** Cuff Links; Cuffs over Elbows instantly without unbottoning; lowered, they close automatically; sells like wildfire; great convenience and shirt saver. Enormous demand everywhere. Liberal exclusive proposition for experienced agents. Master Jewelers, Sheboygan, Wis.

**AUTOMOBILE** or Accessories salesmen with Ford Car, exclusive territory allotted in your locality for fine Ford specialties. 100% efficient, sold on a money-back guarantee to do as represented or what we claim; big commission, easy sellers. Cannot freeze your radiator or engine 40 below zero. Cannot fail in the hottest summer. Write today. Cyclone Mfg. Sales Co., 1110 S. Michigan Ave., Chicago.

**LARGE** manufacturer wants agents to sell guaranteed made-to-measure raincoats. $30 to $75 weekly. Highest commission paid. Profit in advance. Outfit free. Standard Raincoat Co., 395 Broadway, New York.

**WONDERFUL** New Chemical. $1 package equals 50 gallons Gasoline. Eliminates Carbon. 50% more mileage, power, speed, guaranteed. Whirlwind seller. Auto owners buy on sight. 100% profit. Repeater. Demonstrating package, terms, territory, 10c postage. Myers & Co., 28 Baird, Cambridge, Ohio.

**GOOD** income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business; write for free samples showing finishes, etc. Gunmetal Co., Ave. H., Decatur, Ill.

**INCREASE** your income $200 a month. Write for best tire proposition ever offered agent or dealer. Triumph Tire Co., 56th St. and Broadway, New York.

**"SOM-CLAS"** Clothes-line Reel and Tightener eliminates all clothes-line troubles. It sells; it excells. Most wonderful and useful household device of this inventive age. Illustrated page 755 November issue. Sample Two Dollars. Dealers wanted. "Som-Clas," Galesburg, Ill.

**"LITTLE WONDER"** Crown Capping Machines sell to every housewife; equal in efficiency to expensive power machines. Fast sellers. 100% profit. Agents Dealers write. Mincke, Alhambra, Calif.

**AGENTS**—Rub-Not Laundry Tablets are needed in every home—Easy to sell—Quick to repeat. A splendid article, with a unique plan for selling to the stores or homes. Territory allotted, sample free. Rubnot Company, Box 6341-B, Philadelphia, Pa.

**AUTO** Specialties—Free Samples; agents ordering 1,000 monthly; clear profits $2.50 to $5.00 each; easily figured. Jackson Mfg. Co., 1818 Curtis, Denver, Colo.

**NEW** rapid seller; large profits. Write. John D. Black, Kansas City, Mo.

**150%** ON retail sales; 50% on wholesale. Cope Agency, St. Louis.

**MAKE** your own Luminous Watches, Clocks; Luminous Paint, large bottle, 50c. (Coin.) Particulars other Luminous articles, 2c stamp. Illuminant Co., 744B N. Lockwood, Chicago.

**AGENTS** -New Invention Puzzles World. Automobile Specialty, every Auto owner a customer. Write for particulars. Union Mfg. Co., 458 Parker St., Roxbury, Mass.

**MANUFACTURING** Trade Secrets for any purpose. Chemists, 2746 So. Karlov, Chicago.

**TRANSFER** initials for autos. Big profits. Get our $1 trial outfit and be convinced. Circular free. Anderson, 9 Spruce St., Jersey City, N. J.

**WANTED** — Wagon Men Everywhere. Valuable Side Line. 100% Profit. Everybody needs it. Rapid seller. Particulars Free. Crysto Soap Co., Aurora, Ill.

**TRAVELING** Men, Women. Best side line in the world; $1000 monthly; nothing to sell or carry; information only. J. H. Walker, Boulder, Colo.

**MASONS** — Odd Fellows — Knights of Pythias — Woodmen of the World, send $2.00 for chart of your order, 22x28, lithographed in colors; agents wanted. Write for proposition. Hopkins Agency, 98 Dorchester Ave., Providence, R. I.

**AGENTS**—Get Next. Operate Real Estate Business by No-Commission Plan; Capital Unnecessary. Particulars Free. Non-Commission Agency, Lima, Ohio.

**AGENTS:** Immediately write for proof of the fastest selling automobile specialties on the market. Sure success. Big money and a business of your own. Continental Auto Supply Co., Desk A, Davenport, Iowa.

**AUTOISTS**—Use "Karbolene" and save 30 per cent gasoline; guaranteed to remove and prevent carbon; increased power. Agents wanted. Write now. V. J. Dawson, Hinton, W. Va.

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**EXCLUSIVE** Agency for Pacific Coast-Arizona Agents on genuine $75.00 per week proposition. Modern Specialty Company, Los Angeles.

SOMETHING Startlingly New in Honest Merchandise. Sells for 25c. Every home needs one. 200% profit. Sample 10c. Details free. Chas. Whitehead, Cochranton, Pa.

EXPERIENCED crew managers, financially responsible, may obtain territorial control of specialty used and indorsed by City Departments and Federal Government. National Leather Preservative Co., 447 West 31st Street, Chicago, Ill.

AGENTS wanted to sell a new kind of a washing machine; can be carried as sample and demonstrator. Weighs less than 25 pounds. Write for proposition. M. W. Mattison Mfg. Co., Dept. U, Beloit, Wis.

DISTRIBUTORS and Sales Agents with Salesmen Covering State of Georgia Wants Good Line. A-1 Reference. Georgia Distributing & Sales Co., West Point, Ga.

FREE Book on Patents—Write today for Free Copy of "How to Obtain a Patent." Contains valuable information and advice to inventors. Tells how to secure Patents. Send model or sketch of your invention for opinion of its patentable nature — Free. (20 years' experience.) Talbert & Talbert, 4663 Talbert Bldg., Washington, D. C.

AMERICA in the World War—Authentic history profusely illustrated; introduction by Gen. Pershing; big winner; best terms, outfit free. Lindberg Co., Dickey Bldg., Chicago.

GAZOL will make you money—we furnish good printed matter to help you push sales. Repeat order proposition. Write today for full particulars. Odegaard Co., 3323 Hutchinson St., Chicago.

ENERGETIC Men anywhere, city, town, village or country can add $10 daily to income. Ask Safety Hair Cutter Co., Washington, D. C., today—how?

DON'T Accept an Agency before getting our new premium selling plan. We circularize prospects in your name Free. $5.00 to $20.00 daily. Beauty Toilet Preparations. Outfit free to workers. Alfalfa, 820 Northwestern Building, Chicago.

DOUBLE Your Income. Start small building a Profitable Independent Business Manufacturing Popular Advertised Specialties in all lines from an expert Chemist's Guaranteed Manufacturer's Formulas, Trade Secrets and Processes. Investment small. Profits Large. No Experience required. Marvello Washing Tablets, Eg-cono-Me Pure Food Egg Substitute, Blue Ribbon Food Products, Enamelon Wonderful Water Paint, Bevo, Tube Flavors, Magico Windshield Cloth, Carbo-Cide, the only successful Gasolene Tablet for Automobiles, Kor-Kit, the Guaranteed Powdered Puncture Cure—Free Trial. Send Stamps for valuable list of these and many other money makers. 22 years supplying the best in Formulas. Miller, Chemist, Tampa, Fla.

AGENTS: Everlasting Necktie Valet removes wrinkles from used neckties (without ironing them). Sells on sight. 25c. A wonderful invention. Necktie Novelty Co., 190 Pilgrim, Highland Park, Mich.

AGENTS — Mail Dealers, sell Raytone Gems. Big profits. Particulars. Raytone Gem Co., Chicago.

A BUSINESS of your own manufacturing, sparkling glass name and number plates, checker boards, medallions, signs, etc. Enormous profits, big illustrated book sent free. E. Palmer, Wooster, Ohio.

AGENTS Wanted to sell our High Grade Guaranteed Assortment of Household Utility Brushes; also the Little American Indian Broom. American Brush Corporation, 1214-1222 W. Madison St., Chicago, Ill.

WOULD $38 weekly introducing a scientific coal saver—cut coal bills one-third—interest you? Easily demonstrated and quickly sold. Sample and terms furnished. C. L. Winegar, Box 90, West Fort Ann, N. Y.

EVERY housewife wants it. Why not sell her? Larger profits for you. Results guaranteed. Single sample fifty cents. Special introductory offer, eight for one dollar. Corett Specialty Co., Station B, Buffalo, N. Y.

AGENTS, Mail Dealers—Start Magazine of your own. Profitable field. Everything furnished. Terms, sample copy 10c. American Magazine Syndicate, 311-15 Roberts Bldg., Los Angeles.

AGENTS — Your big chance! See our money-making offer on page 178. Horoco Co.

BEAUTIFUL spoons free with "U-Need-It," guaranteed article, $25 to $100 weekly. Variety Supply, 21 East Street, Providence, R. I.

YOU can make $10.00 daily; give $1.00 free goods on $1.00 sale; pay nothing for free goods. Henrietta Company, Dept. 500, Chicago.

MONEYMAKERS Magazine. For Mail dealers—agents. Filled with profitable ideas, 10c. Six months, 25c. 1415 Berendo, Los Angeles.

ARE you satisfied with your present income? If not write for my extremely interesting booklet. Explains splendid plan that should net you $100 weekly. Spare time work—no canvassing. Not a mail-order proposition. Sent free. Address Thomas Steel, Box 1823, Washington, D. C.

WANTED District Superintendent — Reliable man of ability to book orders and engage sub-agents. Whole or part time. Exclusive territory. Pay weekly. Act at once before your territory is assigned. Knight & Bostwick, Nurserymen, Newark, New York State.

MAKE Big Money. Gold Transfer Monograms for Automobiles, etc. Free Samples. Address, National P. O. Box 41, Station D, Brooklyn, New York.

HAVE you something new for sale? Let me be your agent. F. Andresen, Pass Christian, Miss.

AGENTS, $10 to $15 daily. Every owner wants his gold initials on side door of automobile; applied while waiting. Your profit $1.38 on a sale of $1.50. Or sell him a set that he can apply his own monogram. Monogram Supply Co. Write for general agency. Free samples also for our special offer. Gumersall Bldg., Newark, N. J.

AGENTS—Small town, country: Yankee Fire Kindler, 100 fires, 3c. Oil, no kindling, cannot explode, lasts lifetime; 300% profit. Kindler and terms, 25c. Yankee Kindler Co., 206 E. 47th St., Chicago.

NOTHING like these formulas ever on sale before. 30-extra-fine soda fountain syrups and ice creams. Also Face creams, Hand Lotions, Auto Polishes, Carbon Remover and many others. Plain Instructions. All for 50 cents in stamps. Nite Mail Order & Supply Co., 609 27th St., Denver, Colo.

AGENTS: Carbono, The Guaranteed Auto Fuel Saves 30% Gasoline. Increases Power, Eliminates Carbon. $10 to $20 a day. Liberal Proposition. The Dobbyn Mfg. Co., 1136 Wrightwood Ave., Chicago, Ill.

AGENTS — Sell Tipco Emergency Soap to all motorists, machinists, etc. Removes all grease or other dirt without the addition of water. Leaves the hands dry and skin soft. Fast seller — Big profits — Exclusive territory. Sample free. Ignition Plug Co., 1411 W. Broadway, Louisville, Ky.

TWO 1-phase motors, 2-Hp., practically new. Year's Guarantee. $125 each. Hambrick Electric Co., Ft. Worth, Tex.

WE want live representatives in your locality selling Bull Dog Inner Tires. Inner casing for automobile tires. Guaranteed to prevent punctures and blowouts, tire fabric not canvas. Double tire mileage. Easy to sell. Big demand. Protected territory. Agents making $150.00 weekly. Eastern Auto Specialty Co., Dept. A, Utica, N. Y.

AGENTS—You can sell a 10-ounce bottle of "Mystol" Vanilla, "America's Greatest Flavor," at every house, at 50 cents. You make 30 cents. Guaranteed to equal any flavor made and every sale gets you another. Let us tell you how. Write now. Mystol Co., Glens Falls, N. Y.

HERE'S a line you can sell! Big profits too! Fruit Drinks, Spices, Extracts, Toilet Articles, Vegetable Soaps, Remedies, Household Preparations. Over 125 products, all guaranteed. Branches at New York City, Memphis, San Francisco, Winnipeg and Hamilton give prompt shipping service, low freight rates. Ours is the oldest, largest and most successful agency house in the world. Particulars free. Write today. Dept. M.P.-2, The J. R. Watkins Company, Winona, Minn.

AGENTS — To sell household necessity. Every woman wants and buys it. Goods sent to you on credit. You sell them, then pay us. Unsold goods may be returned. You pay for only those you have sold. Absolutely square deal. Write today. This is a money maker. G. H. Brummund, Horicon, Wis.

SIGN Letters for windows. Genuine Gold leaf. $50 week easily made. Chicago Sign System, 326-F, River St., Chicago.

AGENTS are making $25.00 per day selling a mechanical tool. Something the other fellow has not got. It is not sold in stores. The first time it is used it has paid for itself. It appeals to every person owning or leasing a building. Write, James E. Ellis, Mfr., 1040 Georgia St., Los Angeles, Calif.

MAKE and sell your own goods. Machinery unnecessary. Expert Chemists advise. Special attention to beginners. Write for Formula Catalog. Blake Mystic Company, Washington, D. C.

SIGNS for stores and offices. Entirely new. $50 weekly easily made. Chicago Sign System, 326-F, River St., Chicago.

MEN, get into the wonderful tailoring agency business, big profits taking orders and your own clothes free. We furnish fine sample outfit and everything free. No experience needed. Write today. Banner Tailoring Co., Dept. 413, Chicago.

PUTTING new article on market this month. No competition; every store or factory steady customer; 100% profit. Drake, Lock Box 2117, Philadelphia.

ARE you satisfied with your present income? If not, write for my extremely interesting booklet. Explains splendid plan that should net you $100 weekly—spare time work—no canvassing. Not a mail-order proposition. Sent free. Address Thomas Steel, Box 1823, Washington, D.C.

AGENTS—$10 profit on every sale. Russell sold 327 in 5 months; Elliott 187 in 2 months. Oliver Oil Gas Burner makes 2 gals. kerosene equal 97 lbs. coal; fits any coal or wood stove. More heat; turns on and off like gas. Write Oliver Oil-Gas Burner Co., 1385 N. 7th St., Louis, Mo.

NEW Windshield Cloth solves baffling problem. One wipe cleans rain-blurred windshield. Stays clear 24 hours. Motorists amazed. Agents getting rich. 300% profit. Exclusive territory. Cabco Co., Toledo, Ohio.

DISTRIBUTORS Wanted for Every Town. A Selling Winner. Wonderful Coal Saver. Makes Hot Blast of every Furnace. 20% Coal Saving Assured the User. 150% Returns on Investment to Distributors. Get our Proposition Quick. Crown Fuel Saver, Richmond, Indiana.

AGENTS, sell your own Laundry Tablets under your own name and brand. We furnish free samples and two-color illustrated and imprinted circulars with every order. Particulars free. Sample package sent for 15 cents. Krebs A. Products, College Point, N. Y.

AGENTS Wanted: Ladies and Gentlemen; Sells every family. Profits 100% up. Permanent. Sample 25c. Dept. H, Box 527, Stanley, Wis.

ARE you satisfied with your present income? If not write for my extremely interesting booklet. Explains splendid plan that should net you $100 weekly. Spare time work—no canvassing—not a mail-order proposition. Sent free. Address Thomas Steel, Box 1823, Washington, D. C.

REPAIR Leaks Permanently with Kentfram Mastic Cement. Acidproof, Sunproof, Waterproof, Paste Form. Easily applied. Used foundation to roof. 50c money order brings package postpaid. Steady income. Martinek Company, 405 Lexington Ave., New York.

MAKE easy money in spare time pasting up stickers in public places. Advertising Household Specialty. Sample of article and stickers 25c. Thomur Co., Haverhill, Mass.

VULCANIZING auto-tires growing profitable business, especially now. Easy to learn. Instruction book $1. Plants $50 up. Catalog free. Equipment Company, 5 Canal St., Cincinnati, Ohio.

BIG Earnings Easy—Startling invention. Banishes spark plug trouble. Saves gasoline. Sells like wildfire. Exclusive territory. Agents write quick. Jubilee Mfg. Co., Desk 23, Omaha, Nebr.

AGENTS—If you want to make money fast and easy get agency for Christy's Waterproof Shampoo Apron. Something new! Sells in every home. Big bottle Cocoanut Oil Shampoo free with every apron. Also other household necessities. Get particulars; free sample immediately. Christy, 81 Union, Newark, New York.

AGENTS: Everlasting Necktie Valet removes wrinkles from used neckties (without ironing them). Sells on sight. 25c. Agents' price: Ten for one dollar. 190 Pilgrim, Highland Park, Mich.

WONDERFUL Chance. Men's Shirts and Furnishings at wholesale rates or make $10 daily as agent starting real business. Goodell Co., Dept. 44, 5 Duplex Bldg., New York.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk: if she doesn't buy at sight, leave sample, she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credit given. Don't call. P. M. Motter & Sons, 3213 Warren Ave., Chicago.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

TAILORING Agents Wanted—Big complete sample outfit and case, nearly 200 large cloth samples, 3-price lists and everything needed for canvassing, or use in store, free to live agents. $25.00 to $50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information.—See our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 1438, Chicago.

SELL the line that hasn't been worked to death. 25% to 31% more than usual for selling staples. $50 a week easy. $100 a week quite common for those selling our Sanitary Brushes, Dustless Mops and Dusters. Good territory available. Promotion for producers. Modern factory and convenient distributing houses assure good service. North Ridge Brush Company, 107 Clark Ave., Freeport, Ill.

AGENTS—Newest Invention: "Inkspoon" makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 69 Main St., Brooklyn, N. Y.

EVERY Woman Wants Silvoplate—Magic Cleaner that never fails. Sure, easy sales plan; main or sideline; quick profits; prepaid deliveries. Sample 10c; dozen $1.60. L. B. Sutton, Manufacturer, D-3, New Canaan, Conn.

TAILORING Salesmen, and hustlers without experience, to take orders for large wholesale tailors in factories, shops, etc. All or spare time. Wonderful opportunity to earn big money. No investment. We furnish everything. Don't wait, write today. State experience and present employment. Address Commercial Tailors, 838 W. Jackson Boul., Chicago.

AGENTS—Our Guaranteed Products are a necessity for automobile owners and the general public. Big demand; repeat orders galore; big profits. Products for demonstration furnished free. Write Alfred J. Fisher, President, 100, Hannibal, Mo.

AGENTS: $30 to $100 a week. Free samples. Gold sign letters for stores and office windows. Anyone can do it. Liberal offer to general agents. Metallic Letter Co., 431E N. Clark, Chicago.

MAKE $30 next Saturday. Agents—Salesmen—District Managers—brand-new invention selling like wildfire. Sell Speederator for Fords. So good it's used by 17 officials of Ford Motor Co. Makes any Ford run like a Packard. Stops stalling and bucking. Put on quick—no special tools or holes to bore. Instant satisfaction. Listen: make money quick—sell ten to twelve a day easy. McAllister, Ills., sold four first afternoon, profit $12. Helton, Utah, makes over $300 every week. Dano, W. Va., $55 a week spare time only. Hurry; write quick for details and exclusive territory. Address Perrin Company, 1012 Hayward Bldg., Detroit, Mich.

AGENTS Wanted. Address Anderson's, 721 P Exchange, East St. Louis, Ill.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS—If you want to average $10 daily, sell a high-grade line of combs, brushes, mirrors and other novelties in Ivoryware. Direct from factory to consumer. Enormous demand. Particulars free. Yaneco Ivoryware Co., Leominster, Mass.

DROP Everything Else. Sell Guaranteed Silk hosiery and underwear all or spare time, direct from factory to consumer. Big money maker. Big commissions. Prompt deliveries. C. & D. Company, Dept. 12, Grand Rapids, Mich.

SPIRAL Curtain Rods; Broom protectors; Ironing board clips. Tremendous sellers. Moore Co., 800 Jerome Ave., Cincinnati.

AGENTS — Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlin Company, Department M, Clayton, New Jersey.

PATENTS—Write for our free illustrated guide book, "How to Obtain a Patent." Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 431D N. Clark St., Chicago.

AGENTS: Sell Neverfail iron rust and Stain Remover. Huge Profits. Big line. Sample. Write today. Sanford-Beal Co., Inc., Newark, N. Y., Dept. 6.

A WHIRLWIND seller for man with auto. Our big Six-In-One tool, the Handy Worker: comprises anvil, vise, pipe vise, drill press, corundum grinder and cutting hardie. Weight 90 pounds. Sells for $20 with fine profit to you. Always pleases. Every farmer, janitor, plumber, private or public garage, small shop, etc., a prospective buyer. No trick to sell it and big money to be made. Write Chicago Flexible Shaft Company, Dept. S. O., 5600 W. 12th St. Chicago.

AGENTS—Most wonderful seller; 90c profit every dollar sales; no license required; no stock to carry; sample free. Mission Bead Company, 1617 Irola, Los Angeles, Calif.

ENORMOUS Profits selling Duo Guaranteed Products. Easy sales at every house. All or spare time. Outfit Free. Write Quick. Duo Co., Dept. AL, Attica, N. Y.

AGENTS wanted to sell Eggnit—a pure food substitute for eggs. Easy selling article—big profits—quick repeater. Stuart & Co., 16 Main St., Newark, N. Y.

AGENTS—Quick seller. Big profits; California Rosebeads, selling like hot cakes. Hustlers coining money. New stuff. Free catalog. Mission, 2819PM, W. Pico, Los Angeles, Calif.

AGENTS — Something different! Our Eradium (Luminous) Crucifix actually Shines in the Dark. Startling! Mysterious! Wonderful enthusiasm follows every demonstration. 150% profit on every sale. Sole manufacturers. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

AGENTS make $100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, Desplaines, Ill.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Company, 2 Daily Record, Baltimore, Md.

"STOVOIL" is not merely stove polish but a rust killer and preventive. Women are crazy about it. Profits big and fast. Much repeat business. Write at once. Superior Laboratories, Grand Rapids, Mich.

AGENTS—A New One! Harper's Fibre Broom and Ten-Use Brush Set combined. Saves broom expense; lightens housework; easy seller; first order returnable. Harper Brush Works, Dept. X, Fairfield, Iowa.

NEW Carburetor for Ford Cars, simple, not a moving part, installed in thirty minutes, guaranteed to double your mileage and start in zero weather without heating or priming. 15 days' Free trial. Our St. Louis man sold 2,000 in 8 months. Salt Lake City man made $1,200 in one week. Write U. & J. Carburetor Co., K-505 W. Jackson Blvd., Chicago.

SELLS like hot cakes. Big profits. New ironing wax also starch. Perfumes clothes lasting violet. Working outfit 5c. Territory given. Marshall Manufacturing, 919 Gates Avenue, Brooklyn, N. Y.

IDEAL Sideline. Business men buy on sight. $1.00 seller, 400% profit. K. Home, 1957 Warren, Chicago.

MAN—To distribute samples, circulars, for "Foot Ointment," mail or hand; splendid opportunity. Write us today. Address The Elder Co., 294 Parkdale, Buffalo, New York.

AGENTS—New Patented Curtain Rod; necessity in every home; 100% profit; 4 to 10 sales at every home; write for free sample. Home Curtain Rod Co., Providence, R. I.

AGENTS are making $25.00 per day selling a mechanical tool. Something the other fellow has not got. It is not sold in stores. The first time it is used it has paid for itself. It appeals to every person owning or leasing a building. Write, James E. Ellis, Mfr., 1040 Georgia St., Los Angeles, Calif.

SEND for free catalogue "Golden Opportunities." Typewritten tested Formulas, Chemical Analysis, Trade Secrets in every line. No printed trash. Satisfaction guaranteed. Industrial Sales Service, 73 Washington, Memphis, Tenn.

PORTRAIT Agents. For Quality Portraits at Right Prices, with Quick Service, Write the Service Art Co., Sta. D, Chicago.

EVERY Home on Farm, in Small Town or Suburb needs and will buy the wonderful Aladdin coal-oil Mantle Lamp. Five times as bright as electric. Tested and recommended by Government and leading Universities. Awarded Gold Medal. One farmer cleared over $500 in six weeks. Hundreds with rigs or autos earning $100 to $300 per month. No experience needed. Excellent spare time and evening seller. No Capital Required! Write quick for distributor's proposition and lamp for free trial. Mantle Lamp Co., 917 Aladdin Bldg., Chicago.

AGENTS! Quick Sales! Big Profits! Outfit free! Cash or credit. Sales in every home for our beautiful Dress Goods, Silks, Hosiery, Underwear and General Dry Goods. Write us today. National Importing & Mfg. Co., Dept. LD, 425 Broadway, New York.

AGENTS, $50 a week. Will show you how. Genuine Gold Leaf Window Letters. Chicago Agency Co., 842 Altgeld St., Chicago.

SELL this new auto wonder: Mystic-Cloth solves blurred windshield danger; one rub, presto! glass stays clear 24 hours; rain or snow, auto or railways—same magic result; agents sold 30,000 first month. Security Mfg. Co., Dept. 160, Toledo, O.

500 AGENTS wanted at once for Mitchell's Magic Marvel Washing Compound. 300% Profit, Enormous Repeater. Washes Clothes spotlessly clean in ten to fifteen minutes. One thousand other uses in every home. Astounds and delights every woman. Nothing else like it. Nature's mightiest cleanser. Contains no lye, lime, acid or wax. Free samples furnished to boost sales. We positively guarantee the sale of every package. Exclusive territory. Own Your Own Business. You cannot fail to make big money. Barber, Ohio, made $600 last month. Send for free sample and proof. Hurry! hustle, grab this chance. L. Mitchell & Co., Desk 300, 1312-1314 E. 61st, Chicago.

AGENTS are coining money selling Brussels Fibre Brooms. Outlast six corn brooms. Retail $1.75. Sample postpaid 78c. Also Sanitary Brushes. Cramer Mfg. Co., Wichita, Kans.

AGENTS—No matter what you want, if you know the trade name or brand of any article, but not the manufacturer, we will furnish the information for 25c. Colman Mercantile Co., 4421 Manchester Ave., St. Louis, Mo.

AGENTS—Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in 4 days. Profits, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post, prepaid, $1.19. E. H. Condon, Importer, Stonington, Maine.

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**AGENTS make 500% profit handling** Auto Monograms, New Patriotic Pictures, Window Letters, Transfer Flags and Novelty Signs. Catalog sent Free. Hinton Co., Star City, Ind.

YOU can letter Automobiles, Windows, Trunks, etc., without previous experience, by Transfer Process. Make $27.50 on $2.50 outfit. Auto Monogram Supply Co., 86 Niagara Building, Newark, N. J.

WONDERFUL Small Article. Every man needs. Agent sold 14 one office; profit $2.45. Carry hundred in pocket. Particulars and 2 samples 25c. Arrow Mfg. Co., 778 17th St., Milwaukee.

AGENTS wanted to sell my Galvanized Steel Suction Washer. Stamp for particulars. Obetz, Hayesville, Ohio.

AGENTS—500% profit; Sign letters for office and store fronts. Samples and particulars free. Inter-State Letter, 2620 North Halsted St., Chicago.

MINUTES Pay Dollars demonstrating new $10.00 Adding Machine. Wonderful invention. Adds, Subtracts, Multiplies, Divides, automatically. Whirlwind in speed. Infallibly accurate. Work equals $200 machine. Five-Year Guarantee. Offices, stores, factories buy from one to dozen. Enormous demand everywhere. Big Profits. Write quick for trial offer and protected territory. Calculator Corporation, Dept. F, Grand Rapids, Mich.

AGENTS: Big Profits putting up Genuine Gold Leaf Window Letters; Script and 15 other Styles. Chicago Agency Co., 848 Altgeld St., Chicago.

AGENTS—Men and women—100% profit selling Cascade Steam Washer. Great time and labor saver, thousands in use. Sells quickly on demonstration. Live wires make $20 and up daily. H. M. Sheer Co., Quincy, Ill., Dept. C-6.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS Wanted — Economy Kerosene Burners for cooking and heating stoves and furnaces. Big profits. Exclusive territory. Economy Mfg. Co., Dept. D, 616 W. Monroe St., Chicago, Ill.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester, N. H.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold, it vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

HIGH Class Laundry Specialty every woman will use. Not a Laundry Tablet—absolutely new. Repeater. 100% profit. Investigate immediately. Lawrence Chemical Co., Marietta, Ohio.

MEXICAN diamonds flash like genuine, fool experts, stand tests, yet sell for 1-50th the price. Few live agents wanted to sell from handsome sample case; big profits, pleasant work. Write today. Mexican Diamond Imp't. Co., SW, Las Cruces, N. Mex.

AGENTS. 100% Profit selling our Automobile and Furniture polish. The Brownola Works, Dept. A, 336 15th St., Buffalo, N. Y.

AGENTS: The demand for "Kar-Ben-Ex" is growing greater every day. Join our sales force, and make 150% profit, territory is going fast. A postal will do, send it Now. American Sales Co., B. 401, Haverhill, Mass.

WANTED 500 new agents at once. Make 100% profit selling our silver and metal polish. Send 25c for full size jar, or $1.50 per doz. The Brownola Works, Dept. A, 336 15th St., Buffalo, N. Y.

AGENTS, deal with the manufacturer. Best goods, prices and profits. Food products, Soft Drinks, Toilet Preparations. Easy sellers for men and women, experienced or beginners. Outfit furnished. Fletcher Production Co., 315 Clinton, Chicago.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, California.

SPLENDID opportunity for live sales managers to control City, County and State agencies for Rexblu. Stevens Wiley Mfg. Co., Inc., Diamond and Fairhill Sts., Phila.

AGENTS — To sell the Four-In-One Wringer Mop; Just out; A Sanitary Mop, Adjustable Mop Wringer, Scrub-Brush and Scraper Combined. The Mop which wrings exactly like a clothes-wringer; Guaranteed for three years; 100% profit; Agents coining money; Highly endorsed; Territory given to General Agents and protected; The best Agents' proposition on the market today; Let us prove it to you. Write at once for terms and territory. Four-In-One Mfg. Co., 445 N. 11th St., Philadelphia, Pa.

HOW Much Gasoline can you sell at 2c per gallon? World tests for Four years to prove it. Secure exclusive rights for your county. "Carbonvoid," Box "H," Bradley Beach, N. J.

YOUR coal bill can be shaved! We have been shaving coal bills for four years. Let us show you the "Evidence." You can secure the county right. Try it.—Your money back if you're not satisfied. "Koaline," Box "Q," Bradley Beach, N. J.

GET our big money maker monogramming Autos, etc., by transfer method. Catalog and particulars free. Motorists' Accessories Co., Mansfield, Ohio.

KEROSENE Gas Burners in Cook stoves, stop use of wood or coal. Patented. Get exclusive territory. The Vapor Gas Burner Co., Desk 8, Columbus, Ohio.

FREE! Patent buyers' names. Patent News-m. Washington, D. C.

AGENTS. $10 a day selling our Gritless Mechanics Hand Soap. Exclusive territory. Send 25c for full size can. The Brownola Works, Dept. A, 336 15th St., Buffalo, N. Y.

SOAP Agents, send for Free sample and selling scheme. Morgan Supply Co., 113, St. Louis.

## HIGH-GRADE SALESMEN WANTED

SALESMEN—To sell the well known line of Rock-A Bye nursery accessories to furniture, hardware, department, variety stores and baby shops. Liberal commissions, state your line, experience and give references. Perfection Mfg. Co., 2701 N. Leffingwell, St. Louis, Mo.

SALESMEN Wanted. $20.00 daily earned by steady workers. Write for letters from men who are doing it. New Automobile article, sells rapidly everywhere. Experience unnecessary. Write Deco Co., Department D, Springfield, O.

OUR protected article exclusively owned and controlled by us clears upward of $35.00 per day for salesmen. Most essential. Government created demand. Large territories to salesmen able to handle crews. Side-line or full time. If you cannot sell this specialty you will fail selling life preservers on a sinking ship. Definite co-operation. Jerome Leadt, Pres., 8 South Dearborn Street, Chicago, Ill.

FREE Salesmanship Course. Our practical money-earning course is paying our student salesmen from $15.00 to $40.00 a day right at the start. One young man who never sold goods before made $41.00 in his first day and a half. Samples will be loaned you on letter reference so you can earn while you learn. "Sales Course Dept." 102 22nd St., Milwaukee, Wis.

EXPERIENCED Premium Plan Salesmen to sell the "Hilco" Profit Sharing System to Merchants, Flour Millers, Bottlers, Tea and Coffee Dealers, etc., etc., everywhere within a thousand miles of Chicago. Adapted to any line of retail, wholesale or manufacturing business. Liberal Commissions. Hinkle-Leadstone Co., Dept. P, 180 N. Wabash Ave., Chicago, Ill.

MANUFACTURER'S Agent wanted to act as exclusive local representative for several new high-grade specialties selling to garages, general manufacturing plants, etc. No competition. No investment required. Territory now being assigned, commission basis. The right men can establish a permanent, profitable business. For application forms, address P. O. Box 317, Newark, N. J.

SALESMEN—Side or Main line, to sell low-priced 5,000-mile guaranteed tires. 30x3½ non-skid sells for $11.95; other sizes in proportion. Good money-making proposition for live wires. Write, Consolidated Tire Co., 616 So. Michigan, Chicago.

SALESMEN: To sell Gum Vending Machines and Ball Gum. Liberal commissions, exclusive territory. Dunwin, 1314 Chestnut, St. Louis.

SALESMEN Wanted — Brewery, Cigar, Drug, Coffee, Grocery, Candy Men. Sell Gum Vending and Trade-Boosting 5c Machines. Cash or credit. $9 commission each sale. Renewals on Gum. Sell 100 Machines $300. Monthly Renewal. Peanut and Gum Operators, Inquire. One Sanichu equals 20 Penny Vendors. Exclusive Territory. Sanichu Gum Co., 3624 Cottage Grove Ave., Chicago.

SALESMEN—City or Traveling Experience unnecessary. Send for list of openings and full particulars. Prepare in spare time to earn the big salaries—$2,500 to $10,000 a year. Employment service rendered members. National Salesmen's Tr. Ass'n, Dept. 125-W, Chicago, Ill.

TWO salesmen making coast to coast automobile tour, starting January First, desire several meritorious sales or advertising propositions. Submit particulars immediately. Box 1047, Jacksonville, Fla.

SALESMEN: To sell securities in company manufacturing wonderful invention. Great demand, highest commercial reports. Agents earn $130 upwards weekly. Good sideline. Write today for sample and particulars. Graham & Co., 66 Broadway, N. Y.

SALESMEN: Immediately write for proof of the fastest selling automobile specialties on the market. Sure success. Big money and a business of your own. Continental Auto Supply Co., Desk B, Davenport, Iowa.

SALESMEN, get this live winter specialty—the Hot Spot Starting Primer for your Ford motor. Heats the manifold and primes the motor with hot gasoline. Start your car with ease in zero weather. Ford owners delighted. Retails at $3.00. Liberal discount. Fully guaranteed. Particulars free. R-276, Auto Products Co., Washington, Pa.

SALESMEN each county and city make ten dollars a day and more. Necessity to every car and truck owner. Duplicate orders increase your income. Write for particulars. Nob rac Company, Room 328, 1777 Broadway, New York City.

WILL Stick and Stay Stuck, Tube repair outfit, 35c, 60c and $1.00. Liberal discount to dealers. Salesmen wanted. Emesco Supply Co., 1410 W. 63d St., Chicago.

SALESMEN—$10—$15 daily selling gold transfer letters for autos to supply stores, garages, etc. Send for free samples of your initials; general agency given. Transfer Supply Co., Gumersall Bldg., Newark, N. J.

SALESMEN, $100 a week can easily be earned, selling our high grade phonographs. Write us for our proposition. National Phonograph Co., Dept. 20, 518 Penn Ave., Pittsburgh, Pa.

WANTED—Salesmen with Ford or small car to sell 5c candy specialty to retail trade; exclusive territory; live salesmen can make $50 to $75 per week; state experience and references. Ramsay Products Co., Chicago.

SALESMEN to sell Oils, Belting, Paint, Roofing, Roof Cement, general supplies to garages, factories, mills, stores, auto owners, farmers, threshers. Splendid proposition. Paid weekly. O. L. Doty, Dept. 33 B, Cleveland, Ohio.

SALESMAN to sell Universal Soot Destroyer to hardware dealers and engineers of steam plants. Northern Chemical Works, 1308 N. Wells St., Chicago.

DISTRICT Managers Wanted. The latest discovery in Polishes. Cleans and polishes automobiles without the use of water. A twentieth century furniture polish. We want district managers everywhere. $1 brings you sample case and proposition. The U-Kan Company, Dept. B, Lykens, Penna.

SALESMEN for excellent proposition, side line also. Box 242, Passaic, N. J.

BIG Men wanted to manage exclusive selling territory. Only low priced universally adapted, draft operator on the market. No triflers. If you can invest $175 in business of proven merit since 1910 get particulars. V. F. T. Company, 190 Main, White Plains, N. Y.

SALESMEN—Pocket Side Line. Law compels use. Highly endorsed; patented; nothing like it on market; good seller; good commission. Muzzle Co., 333 S. Dearborn St., Chicago.

SALESMEN in every state wanted to sell our High Grade Combination Assortment of Household Utility Brushes to dealers. An exceptional opportunity. American Brush Corporation, 1214-1222 W. Madison St., Chicago, Ill.

ALASKA salesman wants a few good lines. Address Box 74, Cordova, Alaska.

SALESMAN, Energetic man to handle our line of high grade advertising and commercial pencils, good commissions. Write, Peerless Pencil Co., Louisville, Ky.

SALESMEN—Sell Gummed Tape Sealing Machines; good profit and extra commission on orders for tape; write International Sales Company, 222 North Wabash Avenue, Chicago, Illinois.

WERE You Ever Offered a Grocery Store? You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee and entire line of Groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: any Bank or Express Co.

$40 TO $100 a week. Free Samples. Gold Sign Letters anyone can put on windows. Big demand. Liberal offer to general agents. Metallic Letter Co., 431C, N. Clark, Chicago.

FASTEST Selling Advertising Specialty Made. Your customers—why not sell them. Best side line yet. Look us up, then write C. E. Erickson & Co., 202 Erickson Bldg., Des Moines, Iowa.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Bead Company, SP2819 West Pico, Los Angeles.

SALESMEN Wanted to sell Electric Cigar Lighters and Moisteners. Salary or commission. You carry stock or we ship direct. Write for special offer. Drake Mfg. Co., 221 Grand, Milwaukee, Wisc.

SALESMEN wanted to solicit orders for Lubricating Oils, Greases and Paints. Salary or commission. Address The Lennox Oil & Paint Co., Cleveland, Ohio.

REPRESENTATIVE Wanted — We want an aggressive man to devote whole or part time on substantial, dignified, high-class proposition. Every steam plant a prospect. Every order means a repeat. Address Dept. H. 1750 Monadnock Blk., Chicago.

SALESMEN can make $5.00 daily selling our Calendars, Adv. Novelties, Pencils, Blotters, Signs and Thermometers; liberal terms; sells entire year; fine, side lines; local and traveling agencies. Model Calendar Co., Dept. 226, South Bend, Ind.

SALESMEN, Agents and Dealers, we want you to handle your own county or district and make big money. We manufacture the best values in phonographs. The Classic, hundred-dollar phonograph, retails for sixty-nine fifty. A hundred and twenty-five dollar phonograph retails for seventy-four ninety-five. Half profit to dealers. Other types, price from seventeen-fifty upwards. Illustrations and full particulars sent on request. Samples furnished on thirty days' trial. Send references with first letter. Classic Phonograph Makers, Dept. PM., 316 S. Wabash Ave., Chicago, Ill.

SALESMEN — Complete line Sanitary Brushes, Mops, Brooms, combining highest quality with latest designs. Best house-to-house proposition in America. Our salesmen actually clearing $7.00 to $25.00 daily. District Managers chosen from experienced salesmen. Sanford Brush Company, 544 West Lake St., Chicago.

"GALLAHER made $336.00 one week selling guaranteed Collection Systems used by all business men." Sayers Mfg. 2815 Sheffield, Chicago.

## HELP WANTED

ARTISTS in Great Demand. Big salaries paid for full or part time. Learn quickly at home in spare time. Commercial Art Cartooning, Illustrating, Designing. Outfit free to new students. Send for handsome Free Book. Write Now. Washington School of Art, Inc., 1454 H St., N. W., Washington, D. C.

MEN and Women Wanted by Government for many kinds of civil service work. Splendid salaries, short hours, other advantages. There may be a place for you. Investigate at my expense. Send name for List RR 2026, free. Earl Hopkins, Washington, D. C.

YOUR Chance! Used correspondence courses, all kinds. (Courses bought.) Write, Lee Mountain, Pisgah, Ala.

AGENTS — Christmas Articles — go like Hot Cakes around the Holidays. Your chance to clean up $200 to $300. Write quick for particulars. American Products Co., 1437 American Building, Cincinnati, O.

AMERICAN Made Toys Wanted. An opportunity for homeworkers on small scale and manufacturers on large scale. Unlimited quantities needed of Toy Soldiers, Army, Navy, Marines, Cannons, Machine Guns, Warships and other toys and novelties. Greatest chance for industrious people for independent business. Enormous demand and future in American Made Toys all over the United States, Canada, Mexico and South America with over 50,000 10-cent Stores and toy dealers. This new American industry stands out conspicuously. Factories are established, people trained, machineries made. Christmas Sets needed in millions this year. The great hit for 1919 without any competition. We are buyers of these goods all year, paying fixed prices. Attractive prices offered for painted goods. Experience or tools unnecessary. Hundred and more made complete per hour. Castingform outfits from $3.00 up. If you mean business, send for booklet and information free. Toy Soldier Manufacturing Co., 32 Union Square, New York.

BETTER Pay, shorter hours, easier work and other advantages can be had in Government positions which are easy to secure now. You owe it to yourself to find out if you are qualified. No expense. Just send name for Form RM 2026, free. Earl Hopkins, Washington, D. C.

YOU are a failure if you are working hard, long hours for low pay or your job is insecure. Why not find out without cost whether you can get a Government Position where pay is better, work easier, hours shorter, and many other advantages? There are chances now for thousands of men and women over 18. Let me give you free information. Just write your name, address and number RQ 2026. Earl Hopkins, Washington, D. C.

GOVERNMENT Positions are Desirable. Prepare for Railway Mail, Post Office, Rural Carrier, Customs-Internal Revenue, Departmental, Immigration and other branches through our expert, former Government Examiner. Write for free booklet giving full information about these positions and our Money-Back Guarantee Contract. Patterson Civil Service School, Box 4025, Rochester, N. Y.

ARE you satisfied with your position and prospects? If not, whatever your occupation, investigate your chance in Government Service. Just ask for Form RL 2026, free. Earl Hopkins, Washington, D. C.

PHOTOPLAYS in demand. Make extra money. We show you how. Details free. Rex Publishers, Box 175, H-45, Chicago.

MEN, get into the wonderful tailoring agency business, big profits taking orders and your own clothes free. We furnish fine sample outfit and everything free. No experience needed. Write today. Banner Tailoring Co., Dept. 414, Chicago.

RAILWAY Mail Clerk Examination Soon. Start preparing now. Write today for free booklet. Patterson Civil Service School, Box 6025, Irving Place, Rochester, New York.

BECOME expert auto mechanics. Earn $50 week. Learn while earning. Sample lessons free. Franklin Institute, Dept. M, 801, Rochester, N. Y.

WANTED—Assistant Superintendent Pattern Cutter and Estimator. State salary first letter. Replies confidential. The Breese Bros. Company, 2347 Reading Road, Cincinnati, Ohio.

GOOD pay for names, addresses. Write John D. Black, Kansas City, Mo.

$20 TO $35 per month to any employed person without interfering with regular work. No selling. No canvassing, positively no investment. Enclose stamp. Northwestern Silver Co., St. Paul, Minn.

WE have an opening for a draftsman who is familiar with machine tool designing. State age, experience and salary expected. The Kelly & Jones Company, Greensburg, Penna.

AUTO Experts Wanted, $35 week. Learn while earning. Write immediately. Franklin Institute, Dept. M, 801, Rochester, N. Y.

I AM paying one boy in every town a commission to help me sell Aerial Express Gliders. Write me today, enclosing twelve cents for two gliders. Edward R. Smith, Walla Walla, Washington.

THOUSANDS U. S. Government Census and Railway Mail Positions now open. Men—women, 18 up. $1100-$1700 year. Common education sufficient. Write immediately for list positions. Franklin Institute, Dept. M-21, Rochester, N. Y.

WANTED — Automobile, Tractor and Aeroplane Mechanics, expert tire vulcanizers, Acetylene Welders, expert Ignition and Battery men trained under our system, are in great demand everywhere at salaries from $150.00 to $400.00 per month. We operate positively the largest school system in America teaching practical courses. During the war, this was the only Automobile and Tractor School outside the state of Missouri which was approved and employed by U. S. Government War Department for training soldiers. We teach thoroughly practical courses in few weeks time. Free employment department for students. Special low season rates now on. Write or call nearest school for big new 100 page free catalog and special rates. Address: Dept. 75, Modern Automobile & Tractor Schools, 1803 3rd Ave. W., Spokane, Wash.; 700 Mercer St., Seattle, Wash.; 2512 University Ave., St. Paul, Minn., or Modern Automobile & Tractor Schools Ltd., Dept. 75, 840 Cambie St., Vancouver, B. C., Canada. America's Largest Practical Trade School System.

SUCCESSFUL F. O. B. Organizers all pay income tax. I don't care what your occupation is now. If you have a good personality and can talk convincingly, if you are strictly honest and dependable, if you are willing to work, and if you are not satisfied with your present earnings, I want to place our proposition before you to become a Beaver Organizer, to secure members and establish new lodges. Commission contract exclusively, but it pays. Will also consider men capable of helping to organize their own local lodge and acting as secretary. Write today. R. F. Webster, 721 Liberty Bldg., Philadelphia, Pa.

FREE Book on Patents—Write today for Free Copy of "How to Obtain a Patent." Contains valuable information and advice to inventors. Tells how to secure Patents. Send model or sketch of your invention for opinion of its patentable nature—Free. (20 years' experience.) Talbert & Talbert, 4102 Talbert Bldg., Washington, D. C.

U. S. GOVERNMENT wants Railway Mail Clerks. Average $117 month. Life Job. Common education sufficient. List positions open—free. Write immediately. Franklin Institute, Dept. M-21, Rochester, N. Y.

MEN Wanted. Railway Mail Clerks. $117 month. List positions free. Franklin Institute Dept. M-21, Rochester, N. Y.

LEARN Commercial wireless by mail in ten weeks. Thousands of positions now open for men, women and boys (ages 15 to 45) as radio operators, electricians, mechanics, and inspectors. Salaries for beginners now averaging $210 per month. Opportunity to travel and see the world or locate at one of many land radio offices. We train you by mail or at our local school to qualify for official license. No previous experience or wireless education necessary. Positions guaranteed to all students who secure license. First correspondence radio school in America. Established 1914. Wireless outfit Free to students for home practice. Write for Free booklet. National Radio Institute, Dept. 147, 14th and T Sts., Washington, D. C.

SEVERAL Thousand men—boys, 18 or over, wanted by U. S. Government as Railway Mail Clerks. Permanent life positions through poor times and good. Average pay $1400 year. Advance rapid. Pleasant work constantly traveling. Every second week off at full pay. Paid vacation. Common education sufficient. Write immediately for full list positions open and Fall examination schedules. Franklin Institute, Dept. M-3, Rochester, N. Y.

ATTENTION Citizens: Your Government needs many kinds of workers over 18, pays higher salaries for shorter hours and offers greater advantages. Don't miss your real opportunity by failing to investigate. Just send name for free List RS 2026. Earl Hopkins, Washington, D. C.

YOUNG men prepare as brakemen, firemen, begin now, positions good, write at once for particulars. Trainman's Service Bureau, Dept. 6, Jersey City, N. J.

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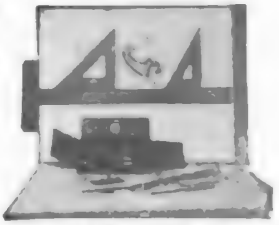

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Continued from Page 50

## PERSONAL

BROTHER—Discovered pleasant Florida root, easily, inexpensively, overcomes any tobacco habit. Send address. Franklin Stokes, Mohawk, Florida.

ST-STU-T-T-TERING and Stammering cured at home. Instructive booklet free. Walter McDonnell, 46 Potomac Bank Building, Washington, D. C.

TOBACCO, cigarette habit conquered. Treatment sent on trial. Eniram Remedy Co., Anderson, Ind.

REMOVE your corns and bunions with Eclipse Corn and Bunion Compound, mailed to any address in the United States; price 35c. Special prices to agents. James R. Howell & Co., Box 5, Argentine Station, Kansas City, Kansas.

TOBACCO Kills Manly Vigor. Quit habit easily. Any form cured or no charge. If cured, $1. Stops craving; harmless. Full remedy on trial. Perkins Co., B-34, Hendley, Nebr.

FREE—Stop using tobacco. We will give free information how to conquer habit easily and permanently. Results Guaranteed. Anti-Tobacco League, Box 370, Omaha, Nebr.

TOBACCO or Snuff Habit cured or no pay. $1.00 if cured. Remedy sent on trial. Superba Co., TP, Baltimore, Md.

## MISCELLANEOUS

HOW to open any lock pin-tumbler cylinder without keys, picks or tools. Wonderful secret. Copyrighted instructions for $1. Chas. E. Williams, Box 1001, Atlanta, Ga.

KELSEY Printing Press, Type, Mounted Fish, cheap. Grutzmacher, Mukwonago, Wisconsin.

MAGIC wax will transfer pictures (not lithographed) from newspapers. Price only 10 cents. Send today. Gilliam, Box 808, Bridgeport, Ohio.

CUTS—excellent $1.25 size 3x3 inches from photos, drawing or prints. Joe Rek, 118 Gazette Ave., Lexington, Ky.

$3.50 AUTOMATIC Adder. Circular free. Bassett, 1458-H Hollywood Avenue, Chicago.

OFFICE Door Signs—"No Admittance—Private — Office — Entrance — Exit — Walk In — No Smoking — Men — Women — Cashier — No Credit — Manager — Chief Clerk—Information—My Busy Day." Printed on 3x9 white cardboard. Ten for 25c, postpaid. P. Detroy, 94 Warren St., New York.

KINDERGARTEN Time Chart. Just the thing you have been looking for. A very simple and easy way to teach your boy or girl to read a clock dial or the art of "telling the time o' day." Sent postpaid, 25c. Coin or money order accepted. A. B. Co., Torrington, Conn.

RUBBER Stamps Made to Order. McCaddon Company, Zanesville, Ohio.

MAKE Big Money Opening Safes and Setting Combinations. Wayne Strong, Box 1430, Los Angeles, Cal.

BUTTER-KIST Pop Corn Machine for Sale—used very little; absolutely good as new. Cost $750. Will sell $350.00. "Hoffman's," Bedford, Pa.

LOCKSMITHS. How to unlock cylinder and all locks. 100 tricks of the trade, $1.00; money back if dissatisfied. Routson, 3406 Andover St., Oakland, Cal.

QUESTIONS Answered. All Subjects. Send now for Circular 6. Answerall Information Bureau, 51 Cliff St., New York.

SUR-ON Key Ring Holder, something new; practical; simple; safe; fits any belt. 15c. Agents wanted. Sur-On Wks., St. Louis, Mo.

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FOR Sale — Hammerless Double-Barrel Gun, brand new, $15.00. J. A. Frazier, Millikin, La.

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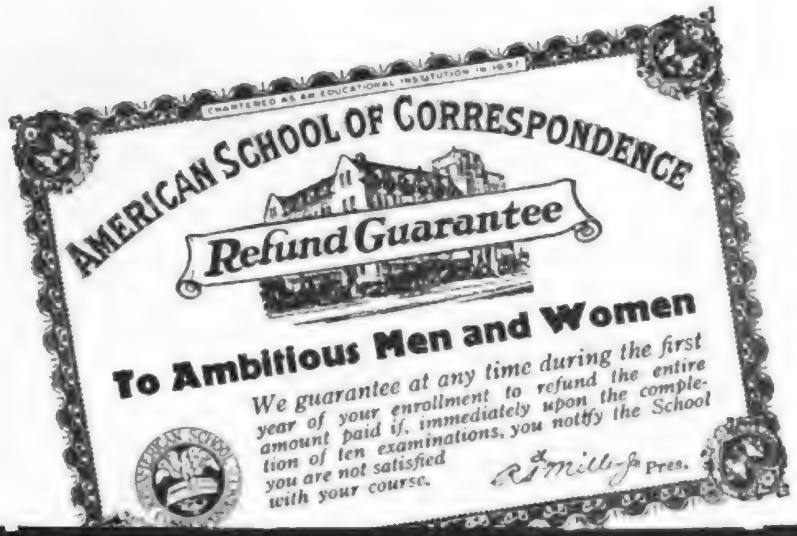


# Find Out What Training Means to You

**What It Has Done** Intensive training has qualified men like YOU for the positions they wanted — given them steady employment—made them sought after by employers—multiplied their earning power — made them leaders in their chosen lines. For thousands, it has changed the drudgery of "getting by" into the joy of GETTING ON. Do you realize that the *same* intensive training can do the same for you?

**Why It Does It** Doing things better than the other fellow—thinking and acting for yourself—having a grip on your task — the expert touch — the trick of KNOWING HOW—that is why you succeed after intensive training. *That is what it does for you.* Training clears away the cobwebs, throws the spotlight on the things you don't know about your work, and makes you the master of any emergency.

## Don't Fool Yourself

Every day you put off training you have to pay the price of *not knowing how.* The amount you earn represents what you know—what you can DO. The problem of how to increase your earning power is simple—just TRAIN. Don't be fooled into thinking that "luck" or "pull" will make you a winner. The man without training just scrambles through life—never a money-maker—never sure of his job—never holding a responsible position. It's the trained man who gets all the favors—the best jobs and the big pay. As long as you refuse to train you must pass up opportunities and make way for the man who does. Face the facts and then let the American School help you into a better position—the one you want—as it has helped its thousands of students. Get into the game. Don't sit on the sidelines.

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# SUCCESS

## START IN THE TIRE BUSINESS

WE are opening new territory, and will appoint about 500 more men, in both Eastern and Western territory, to represent us as Exclusive Distributors in the sales of our Famous "Racine Quality Tires" both Fabric and Cord and our "Vulcanite Fibre Puncture Proof Inner Tubes."

If you are a live wire we want you to write to us and we will show you how to build up the largest and best money making business in your town. All our "Dealer Agents" are rapidly getting complete control of all the tire business in their territory, and they are forging to the front and making BIG PROFITS.

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This is the reason that the "Racine Quality Dealers" are making more money today than they ever made before in any other line of business. This is why business men realizing the unlimited opportunity presented, are contracting for exclusive territory throughout the United States.

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### Racine Quality Heavy Duty Tires

which are built to stand the hardest kind of service—they are extra heavy at every shock point—and they have a specially toughened rubber tread that will deliver far beyond the guaranteed mileage, and there is a Written Guarantee Bond for 5,000 miles of satisfactory service that goes with every tire.

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This amount can be made easily every month by our Dealers simply because we place our representatives in a position to compete with all the local dealers and give them a well advertised line that there is a big demand for at a very large margin of profit and give them the exclusive sales rights in their territory so that they can easily get control of the cream of the Tire and Tube business in their territory. Regardless of who you are or where you are located, if you are desirous of starting in the Tire Business with a high grade line of Tires and tubes—get in touch with us immediately—before your territory is taken. A day's delay might mean that someone else will get control of your territory.

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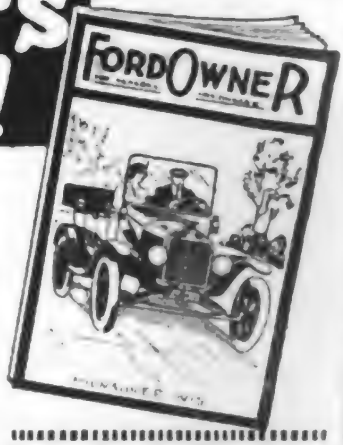


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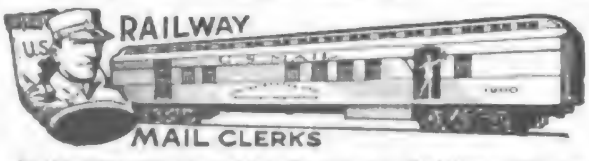


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There were 6,353,233 cars and trucks licensed in the United States up to July 1st, 1919. That astounding list has been added to every day since. The number is now well over seven million and several million more will be made during the coming year. Still the demand is far and away ahead of production. This means tremendous activity for producer and distributor of cars, trucks, tractors and every kind of equipment and accessory; and also for service stations and garages in every part of the country.

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Factories are rushed to the limit; garages and service stations are already crowded for the want of trained men to adjust and repair these thousands of machines. Competent men are wanted in every city and town for this vitally important work. Our Course teaches how to do this work—it fits you to command big money.

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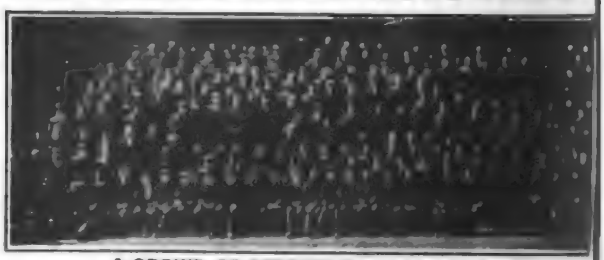
It matters not what you have done or are doing, you can learn this wonderful business of great opportunities if you want to. If you have grit and determination and want to get ahead, our Course will enable you to do it.



A CROWD OF DETROIT TRAINED MEN

## Constant Demand for Trained Men

Every city, town and village wants trained automobile and tractor men. Factories are constantly asking us for graduates; owners in towns and villages want to know where they can find competent men to take care of their machines.

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***We can't begin to supply the demand. Detroit trained men are given preference every time.***

View showing part of the 25 motors in Block Test Department. All types are tested, 2, 4, 6, 8 and 12-cylinder, sleeve valve types, etc.

## What We Teach

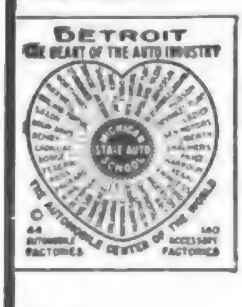
Your success depends upon a thorough understanding of the business. That's why we cover every phase of auto work in Our Course. Every part of a car and its operation, is explained in detail. You are trained to handle any kind of car trouble. Ours is the factory endorsed and factory outlined course. Our reputation for thoroughness is well known in the industry.

## Not a One Man School

Our Course is not made up of one man's ideas, it represents the combined experience of many,—it consists of the latest, newest and most practical ideas of the biggest men in the auto, truck and tractor business.

Our school enjoys the fullest co-operation with manufacturers, service stations, garages and owners,—a factor of vital importance to our students.

A. G. ZELLER,
President




### Our Students Stand Any Test

No test nor examination is too severe for graduates of the M. S. A. S. When you complete Our Course you will have no difficulty in passing any examination required by any State for automobile mechanics, chauffeurs, etc. No matter whether you go into business for yourself or take a position in an auto factory, garage or service station, our training will enable you to handle the work easily and successfully.

### Auto Factories Endorse Our School

Because of the intensive training given our students, the biggest auto factories in the country heartily endorse our School. They know the thoroughness of our methods—the completeness of our equipment. They give us every assistance and co-operation possible. In fact they assisted in outlining our Course. They know the kind of graduates we turn out and are constantly calling on us for men.

A corner of our Repair Department where students receive their final tests before graduation.

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# MICHIGAN STATE AUTO SCHOOL

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# Many of Our Graduates go into business for themselves

# EARN $100 TO $400 MONTHLY

All over the country you will find M. S. A. S. Graduates operating garages of this type and larger.

There is no limit to your earning capacity after you have completed Our Course. Our instructions can be made the stepping stone to a most successful business career. The training you get here will fit you to hold positions which before were out of your reach. Here at the M. S. A. S. you are thoroughly instructed in every phase of the auto industry. You learn every part of the work by actually doing it—a training which enables you to step into the best paying positions in the business.

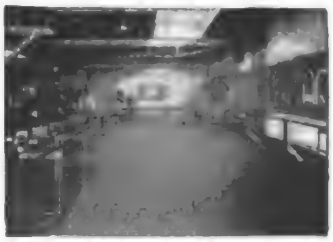
## Unlimited Opportunities

Hundreds of our students go right from our School into business for themselves—something many of them never before thought possible. Our Course convinced them—and will convince you—that they had received a most valuable training—one that enabled them to place themselves in a profitable, money-making business. And these students are successful. They write us of having in comes way beyond their expectations. These men are located everywhere—in large cities, small towns and country districts. They are successful wherever automobile, truck and tractor work is needed because of the intensely practical training given them here at the M. S. A. S.

ONE OF OUR SUMMER CLASSES

## Complete Training in Auto Electrics

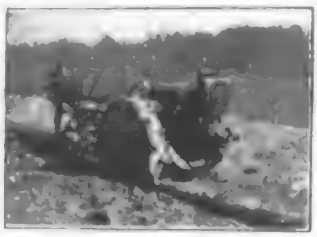
This is one of the most important features of our entire Course. Our equipment for teaching auto electrics is one of the most complete in the business. We have equipment which explains the origin and use of every kind of electrical energy. Each student is fully instructed in the use of various electrical currents and how they are applied to automotive mechanics. This training enables the student to successfully handle any possible trouble which may develop in starting, lighting, ignition, generating, or battery systems. Remember this: Instructions in "electrics" alone is not enough. It requires a combination of "electrics" and "mechanics" if you would attain the practical in results. That's why our complete and unequalled Course in automobile mechanics, coupled with our complete and highly practical instructions in auto electrics, gives our students the training that is most vital—a training which absolutely insures success in the auto, truck and tractor business.



Electrical Demonstration Department where students are thoroughly instructed on Auto Electrics. Every known type of starting, lighting and ignition system is included in our equipment.

## Complete Tractor Course Included

You are also given complete instruction on the care and operation of Farm Tractors as a part of our regular Auto Course. The constantly increasing use of tractors has created a big demand for trained tractor men. Manufacturers have placed machines with us for the purpose of giving our students the benefit of practical instruction along these lines.



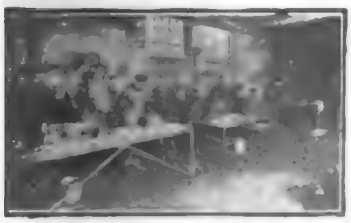
Tractor operators, repairmen and salesmen have a wonderful future ahead of them. There is room for them all over the world.

## Our Students' Welfare Department

This work is in charge of Mr. S. W. Maxwell who devotes his entire time to looking after the personal interests and comfort of our students. No matter what you may want, be it of a personal or business nature, Mr. Maxwell is here to help you. And long after you graduate, he keeps in touch with you to render any help or assistance needed.

## Money-Back Guarantee

We guarantee to qualify you for a position as chauffeur, repair man, demonstrator, auto electrician, garage man, automobile dealer or tractor mechanic and operator paying from $100 to $400 monthly in a reasonable time, **or refund your money.**



This is a section of the Brazing, Welding and Cutting Department. Each man handles the torches and works with an individual outfit.

## Brazing, Welding and Tire Repairing Taught

Complete separate courses given in these subjects, independent of Auto Course. Big field for trained men.

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Gentlemen: Please send me absolutely FREE, New 16-page Illustrated Catalog, "Auto Service News" and information as checked below.

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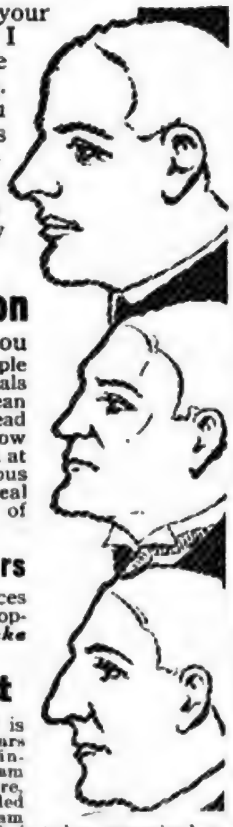
# How to Read CHARACTER

Prof. Henry Dickson, Principal

***Prof. Henry Dickson, foremost authority on Memory Training and founder of the Dickson School (Established 1900) offers you his new, practical course in Character Analysis.***

Mail coupon below or send your name and address on a postal. I will then send you my complete course in Character Reading. Keep it five days. Then if you are not thoroly convinced of its inestimable value return it without expense. All I ask is that you follow a few suggestions and see for yourself how easy it is to read character.



## A Priceless Possession

What would it be worth to you to know the true character of the people you meet! Every human face reveals certain characteristics. But they mean nothing to you if you are unable to read them quickly and accurately. I show you how to "size up" men and women at a glance—how to penetrate the various guises they assume to mask their real character—how to be the master of every situation.

## Develop Your Hidden Powers

Do you realize there are hidden forces within you capable of wondrous development? ***Let me show you how to make the most of yourself.***

## Not an Experiment

My course in Character Reading is founded upon solid facts gained from years of practical experience. I have been instructor in many leading Universities and am Fellow of the Society of Arts and Literature, London, England. Twenty years ago I founded the Dickson School of Memory and am still principal of that institution, which is today recognized as the most thorough and practical system of memory training.

## Mail Coupon Today!

I want you to examine this course wholly at my risk. Send no money. Just mail the coupon. The complete course will be sent to you by return mail. Judge its merits by the amount of practical benefit you obtain during the five days it is in your possession.

If you then decide to keep it, send me $3. This includes **my personal instruction and a complete analysis of your own character.**

## *READ THIS LIBERAL OFFER—SEND TODAY!*

**Prof. Henry Dickson, 421 Hearst Bldg., Chicago**

Without obligation to me, send me your complete course in "How to Read Character." If I decide to keep it I will send you $3.00 within 5 days. Otherwise I will return the lessons in good condition.

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**North-Western School for Stammerers, Inc., 2317 Grand Ave., Milwaukee, W**

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**Stage Work and Cabaret Entertaining** success fully taught by mail. Your opportunity to enter fascinating, money-making profession—to travel—see the world—as vaudeville actor or actress. My simple, easy, complete Professional Course—only one of its kind—**COVERS ALL BRANCHES.** Develops **Personality, Confidence, Skill,** and tells you just how to get on the stage. Send 6c postage for big booklet, **"All About Vaudeville."** Give age and occupation

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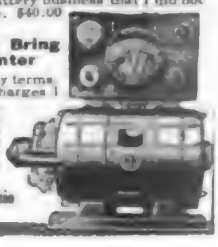
**READ WHAT ANOTHER H B USER SAYS ABOUT H B PROFITS:**

Maxwell Garage, Lexington, Ill., Pop. 1,000 writes, "Average income $40.00 to $50.00 a week. Expense for current, $10.00 per month. Your HB machine has made an increase in my battery business that I did not think could be done even in two years' time. $40.00 a week isn't bad profit, is it?"

**This HB 500 Watt Charger Can Bring YOU Also Big Profits This Winter**



Small cash payment, balance on easy monthly terms. HB Absolute Money Back Guarantee. Recharges 1 to 6 volt batteries (or 3 to 12 cells each, customer picks 3a to 12 50. No burnouts, no extensive materials, steady, reliable service. Easy to install and operate. No electrical knowledge required. Fill this ad in your letterhead and mail TODAY for information.

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# Why He Earns $30,000 a Year

## By Victor Jones

## Who Improved His Memory in One Evening

Here is perhaps the most remarkable story of memory power—and what it will do to send a man ahead in business—that I have run across since I learned, to my own great advantage, the secret of a better memory from David M. Roth, the famous memory expert.

It is the true experience of two clerks in New York City who started together, side by side, at the modest salary of $12 a week.

I have the facts straight from John Wesley, one of Mr. Roth's most successful pupils, who began his own business career in the same office with the two clerks, Powers and Weeks, whose story I am going to tell you.

I shall give it in Wesley's own words—as nearly as I can recall them—adding that he himself, at 32 years of age, has risen to the Treasurership of one of the best known corporations in New York City.

"Powers," said Wesley, "developed an accurate memory. Weeks was always forgetting. Powers with his dependable memory proved himself invaluable to his employers. He got on amazingly. He was always being pushed ahead. A raise in salary was to him a fixed semi-annual event.

"Facts and figures he had at his finger tips. He could always be counted on to do anything he was told because his employers found that they could count on him—he always remembered.

"Weeks, poor chap, was just the opposite—he was never sure of anything. He always 'guessed' or 'thought,' but never seemed to know.

"The man with the memory is now, a few years later, the head of a giant publishing enterprise with a handsome interest in the business and a salary of $30,000 a year.

"The man who could not remember is now collecting petty advertising bills for a New York newspaper. His salary is about $20 a week.

"You see the success of Powers and the failure of Weeks were largely due to one's remarkable memory and the other's inability to remember.

"I am sure this is the answer, because I had an opportunity to observe both men at close range in their daily work."

### The Sequel

I saw Wesley five months later and as we were talking about the extraordinary success of the Roth Memory Course I recalled the case of Powers and Weeks.

"That's funny," said Wesley, "Do you know I ran into Weeks only yesterday in Times Square and you never saw such a change in a human being. He is in a fine new position and is going ahead fast.

"I always believed he had good stuff in him if he ever found out how to use it—but I never dreamed he would get on his feet in five short months; for the last time I saw him he was about the sorriest spectacle you can imagine.

"And to what do you think he attributes his new grip on himself?

"Nothing more or less than the Roth Memory Course, which I sent him in the hope that it would bring him to.

"Not only has Weeks found his memory but he has become keener and more observing. He says it is a wonderful feeling to be sure of his facts, as Mr. Roth's lessons have taught him to be.

"He says he is getting to remember faces and names about as easily as his A B C's and the same with telephone numbers and street addresses and business statistics.

"Weeks may never catch up to Powers, because he let his fellow clerk get a pretty big lead, but I am certain that in another year he will be miles ahead of the point at which he would have been had he not learned from Mr. Roth how to use the perfectly good memory that his recent experience with the Roth Memory Course proves beyond question he possessed all the time."

VICTOR JONES.

For obvious reasons Mr. Jones has substituted the names Powers, Weeks, and Wesley for the real names of the gentlemen mentioned in this story.

* * * * *

David M. Roth began with a poor memory himself. He says that, more than anything else, was what set him to cultivating his own memory and working out the wonderful Roth System which has been responsible for so many thousands of improved memories all over the United States.

Mr. Roth actually could not remember a man's name twenty seconds after being introduced to him.

Yet today there are probably 10,000 people or more in the United States whom Mr. Roth has met at different times—most of them only once—whom he can name instantly on sight.

The accounts of Mr. Roth's amazing memory feats have been published in newspapers all the way from Seattle to New York. He goes into a banquet room or lecture hall and after being introduced to fifty or sixty people turns his back while they change seats. He then picks out every one by name and tells him his telephone number and business connection—for good measure. As Mr. Roth says, there is nothing miraculous about this. Anyone can do it and the other apparently "impossible" things that so astonish Mr. Roth's audiences.

### A Better Memory in One Evening

Mr. Roth's System, which he has developed through years of study, has been put into a course of seven fascinating lessons, so easy that a twelve-year old child can learn them—yet so effective in their improvement of the memory that hundreds of business executives all over the country—by their own testimony—consider the Roth Course well nigh priceless to them.

Read this letter from Terence J. McManus, of the firm of Olcott, Bonynge, McManus & Ernst, Attorneys and Counsellors at Law, 170 Broadway, and one of the most famous trial lawyers in New York:

"May I take occasion to state that I regard your service in giving this system to the world as a public benefaction. The wonderful simplicity of the method, and the ease with which its principles may be acquired, especially appeal to me. I may add that I already had occasion to test the effectiveness of the first two lessons in the preparation for trial of an important action in which I am about to engage."

Mr. McManus didn't put it a bit too strong.

A single evening spent on the first lesson will give you the secret on which the whole Roth System is based. In that first evening you should easily double your memory power.

Just think what it will mean to you to have twice as good a memory. H. Q. Smith, Manager of the Multigraph Sales Company of Montreal, says:

"Here is the whole thing in a nutshell: Mr. Roth has a most remarkable Memory Course. It is simple, and easy as falling off a log. Yet with one hour a day of practice, anyone—I don't care who he is—can improve his memory 100% in a week and 1000% in six months."

And we could show you hundreds of other letters similar to Mr. Smith's—received in the last month alone. After a few hours with Mr. Roth's Course you will be amazed and fascinated at the new sense of confidence and power that will be yours.

You will be freed forever from the artificial memory tricks to which most of us have been slaves.

You will learn to remember instantly

| | |
|---|---|
| Names and Faces | Statistics |
| What You Read | Facts |
| Speeches You Hear | References |
| Talks | Sermons and Lectures |
| Business Details | Business Reports |
| Selling Points | Good Stories |
| Legal Points | School Lessons |
| Conversations | Household Duties |
| Pictures | Business Appointments |
| History and Dates | Social Engagements |
| Streets and Numbers | |
| Business Figures | |

And you will find it, not hard work as you might suspect, but just as much fun as playing an absorbing game. For Mr. Roth makes the act of remembering an easy, natural, automatic process of the mind.

### Send No Money

Don't send a single penny. Merely fill out and mail the coupon. By return post, all charges prepaid, the complete Roth Memory Course will be sent to your home.

Study it one evening—more if you like—then if you feel that you can not afford to keep this great aid to more dollars—to bigger responsibilities—to fullest success in life, mail it back to the publishers within five days and you will owe nothing.

Mr. Roth's fee for personal instruction to classes limited to fifty members is $1,000 but in order to secure nation-wide distribution for the Roth Memory Course at the time above all others when Americans need all the self-improvement they can get, the publishers have put the price at only $5.

If a better memory means only one-tenth as much to you as it has to thousands of other business men and women, mail the coupon today—NOW—but don't put it off and forget—as those who need the Course the very worst are apt to do. Send the coupon in or write a letter now before the low introductory price is withdrawn.

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**Publishers of The Independent Weekly**

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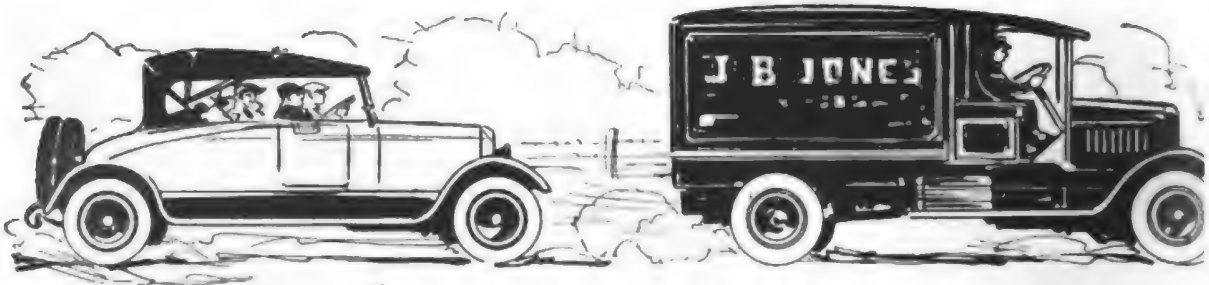
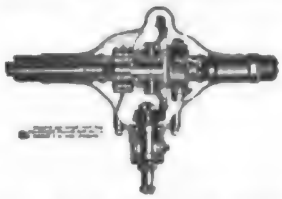



# Keep 'Em Working

## Some of the Things Featured in Oct. Issue

### Rear Axle Care and Maintenance



This article tells about the importance of rear axles; the different types and kinds; how they operate; common axle trouble—their causes and cures; how to lubricate; bearings and gears, care and adjustments; the right and wrong way to make repairs, etc. Written so anyone can understand and apply it. That's why the Auto Digest is such a practical magazine for the autoist.

### "Brass Tacks" for Repairmen

This is an intensely interesting article of value to any owner, garageman or repairman. Fully illustrated with 20 different cuts, of which two are shown above greatly reduced. The down to earth practical manner in which these articles are written is one reason for the growing popularity of the American Auto Digest.

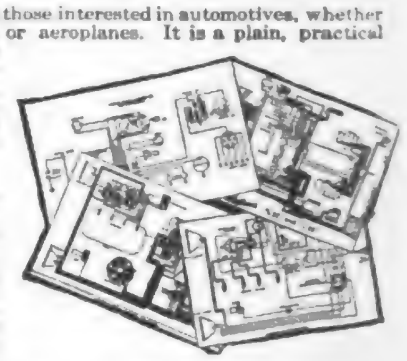
It is extremely valuable to know just what to do to keep your machine in good running order all the time. A slight adjustment here; a little timely attention there, often means the difference between pleasurable and satisfying results and lost time, money and patience.

Thousands of Auto, Truck and Tractor owners and drivers are constantly bothered with puzzling motor problems. Just at a time when their machine is needed most, it positively refuses to work, and—"What to do?"—"Where to locate the trouble?"—"How to fix it?" are common questions that are puzzling. Practical answers, easily understood, are continually being published in the

## AMERICAN AUTOMOBILE DIGEST

**The Popular Magazine for Owners, Repairmen, Dealers and Garagemen**

A Magazine of vital importance to those interested in automotives, whether it be automobiles, trucks, tractors or aeroplanes. It is a plain, practical monthly digest of the latest news and information concerning the automobile world. Brimful of helpful, instructive, money-saving information compiled and written by the best informed and highest salaried men in the field.



## Every Issue a Wonder

Covers every possible phase of the automotive industry; answers every question that could possibly be asked; explains and simplifies thousands of problems that puzzle the motorist. Uncovers motor mysteries that make possible big savings to every auto owner, repairman and garageman.

## ELECTRICAL WIRING DIAGRAMS Shown Every Month

An immensely important feature for every car owner, driver or repairman. Fully explains the electrical equipment of every car. Shows how to make necessary repairs and adjustments. Enables one to quickly locate and correct any starting, lighting or ignition trouble. This feature alone is worth many dollars.

### Read What Subscribers Say

"One paragraph saved me several early subscriptions."

"Am surprised at the wealth of information the Digest contains. It should be compulsory for all auto owners, drivers and repairmen to read it. We would get better results from our cars."

"The Digest is good and helpful. Have just scanned a couple of pages and they are good enough."

"Have read the Digest from cover to cover and find many interesting things worth knowing."

"Digest helps to keep down garage expense."

"I cannot say too much in favor of the Digest. It is a magazine owners should not be without."

"Your magazine is the best I have seen for automobiles. It certainly is fine for repairmen."

"Am greatly pleased with American Automobile Digest. Find it equal to any motor paper published."

"Received the American Automobile Digest and Autocraft. They are worth double the price you ask for them."

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## American Automobile Digest

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Every issue of the American Automobile Digest is timely —up to the minute. Its readers are informed of the latest developments and achievements in the Auto Industry. Deals with everything of interest in the business. Tells the things you want to know in words easy to understand.

## Practical Information About Autos, Trucks, Tractors and Aeroplanes

The entire automotive field is covered. Nothing of importance is overlooked. Every corner of the country is searched; every source of information is tapped for any news of interest and benefit to owners or repairmen of Automobiles, Trucks, Tractors or Aeroplanes.

Any single issue is worth dozens of dollars to any owner, driver or repairman. Contains hundreds of ideas of real practical value capable of application to your problems.

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With every yearly subscription we are giving a copy of this remarkable book. It is one of the most valuable books ever issued on the subject. Gets right down to bed-rock and tells the story of Automobile operation in a way easy to understand. Equally interesting to the veteran and the beginner. Brimful of money-saving ideas.

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"The Digest is the best paper I ever subscribed for in my life. Wouldn't miss a copy for anything. Every copy is worth a dollar."

"I never yet came across anything in the auto line that contained so much valuable information as Autocraft and the American Automobile Digest."

"Am well pleased with Auto Digest. Have learned many things about handling my car. It tells me all about the common difficulties and how to repair them."

"I know very little about automobiles, but your "Don'ts" for the autoist and other hints helped me splendidly."

"Autocraft came a few days ago — also the Digest. Am well pleased with both. One item I found is well worth all they cost."

"The Digest and Autocraft book are received. Both are brimful of valuable information. Am eagerly awaiting the next issue."

"Am very much pleased with Autocraft. It is an excellent book for the busy man. Its suggestions, directions, cautions and descriptions are plainly set forth."

"Your fine magazine arrived O.K. The information an Auto owner gets from it is well worth ten times the price of a year's subscription."

"In looking through Autocraft was surprised to receive such a fine book. The perfect size of type, fine paper — and being so full of useful information — it is actually worth more than the price paid."

"Am more than pleased with the Digest. It is worth ten times the price asked to any motorist. Everything in it is from practical experience."

"I think the Digest is the best Automobile paper I have ever seen."

Thousands of such letters in our files prove the value of our magazine. No auto owner, garage man or repairman can afford to be without it.

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Any single issue is worth ten times the subscription price. Get a copy NOW! Go to nearest newsstand and buy this month's issue, or, fill out this coupon, enclose with your check or money order for $1.50, and the book and magazine will come promptly. Examine them carefully. If they are not all we claim, return the book and we'll refund your money without question.

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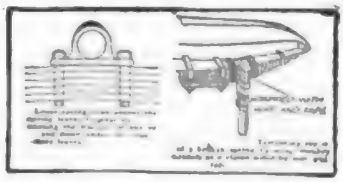
## 92 Butler Bldg., Cincinnati, O., U.S.A.

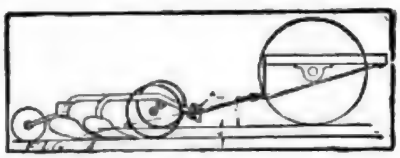
## Tips on What You'll Find in the November Issue

### Motor Car Springs



Here is an article every Autoist should read. Springs are an important part of an auto and too much care can not be given the subject. A little timely attention often saves big expense and this article shows how easily that attention can be given. Fully illustrated. When you've read it you will know why we claim such exceptional value for The Auto Digest.

### Hitching Up the Tractor Plow



Tractor operation is a subject of growing importance, hence the timeliness of this article. As you will see from the reduced illustration, we handle it in a most practical manner and give some valuable information of interest to tractor folks. Motor Auto Digest progressiveness.

## Sign and Mail This Coupon

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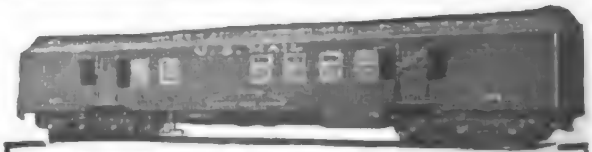

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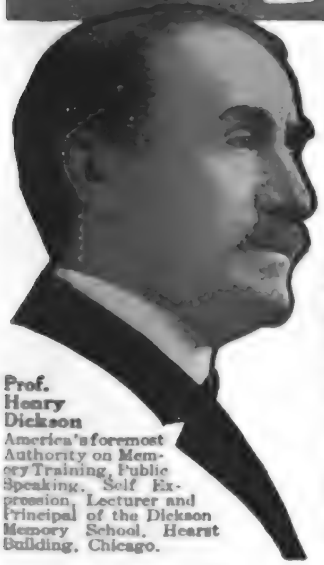
# Stop Forgetting!



**Prof. Henry Dickson**
America's foremost Authority on Memory Training, Public Speaking, Self Expression, Lecturer and Principal of the Dickson Memory School, Hearst Building, Chicago.

## Perfect Your Memory and You Can Command What Salary You Will

Your salary—what it is today—what it will be tomorrow—depends very much on your memory. Tricky memories—wandering minds—unable to grasp detail—have thwarted thousands in their battle for success—have held them down to bare living wages—working long hours with slight prospect of advancement—subordinates for life.

### The Ability to Concentrate, to Think and Express Yourself Clearly Means Everything to Your Success

America's men of power—in business, social or public life—are uniformly men of **trained memories.** Train **your** memory properly and you will find yourself able to concentrate absolutely on matters at hand—to think and speak connectedly—to develop self control, to overcome self consciousness—to make your PERSONALITY DOMINATE. Think what this means—a better position—bigger pay—social and business success—the EFFICIENT LIFE.

### Give Me 10 Minutes a Day and I Will Give You a "Steel Trap" Memory

That is all I ask—just ten minutes a day for a few weeks and I will train your memory just as I have trained the memories of 50,000 others. I will make your mind an infallible classified index from which you can instantly select facts, figures, faces, arguments. No matter what your age—your education—your vocation—your place of residence—I can make you "forget proof"—can train **your** memory for SUCCESS.

### Special Offer! "How to Speak in Public"—FREE!

For a limited period I am offering "How to Speak in Public," a de luxe edition, handsomely bound book—regularly priced at $2.00—FREE to every student enrolling in my course. Full particulars of this unusual offer—together with a copy of my famous Memory Test and my remarkable book "How to Remember" will be sent FREE—simply for the mailing of the coupon or a postal. This is YOUR opportunity—mail it NOW.

### The Public Speaker

*Carl F. Schaider, one of California's biggest men, writes:*

"I have been improved physically and mentally beyond my own expectations by the continued study of your course. Every business man, especially those called upon to talk at Chambers of Commerce, realty boards, advertising clubs and other meetings should take your course. I unhesitatingly recommend it to my many friends."

### In Social Life

*Roland Miller, of New York City, writes:*

"What I have gotten from your method has advanced me both socially and financially and I feel it my duty to tell you of these excellent results."

### The Executive

*Mr. William H. Weeks, District Attorney of Putnam County, N. Y., writes:*

"After a thorough trial of your method of mental and memory training, I find it to be not only first class—simply wonderful. I can truthfully say that I would not be again without the benefits I have received from your study for $10,000."

### The Salesman

*O. G. Wehmeier, of the American Miner's Accident Association, Indianapolis, Ind., writes:*

"I can honestly and truthfully say I am a new person. I have more friends than I really expected I could have. Everyone who has known me says that a wonderful change has come over me in the last six months. It is all due to the Dickson School of Memory."

The Key to Success
**Stop Forgetting**

**Prof. Henry Dickson, Prin. Dickson School of Memory**
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Please send me free of charge and without obligation your booklet, "How to Remember"; also your remarkable copyrighted "Memory Test." Give me facts on your special offer of a free copy of "How to Speak in Public."

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**"They made him manager today, at a fine increase in salary. He's the fourth man in the office to be promoted since January. And all were picked for the same reason—they had studied in spare time with the International Correspondence Schools and learned to do some one thing better than the rest of us.**

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- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
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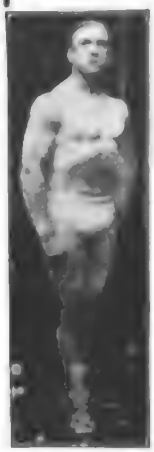

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Strongfortism is simply Nature's way of curing hom life and building up the human organism. No pat medicines or druggist's dope about it. No artific system of tiring exercises; no fancy frills of any kin **Just Nature's way of Living Life.** Strongfortism has p cured thousands of men from the scrapheap of con tated, worn-out manhood. Strongfortism has clean away the ailments that broke them down and has giv them new life and hope and vigor.

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# What could you do?

Once to every man comes a time when he must fight for his life or the safety of a loved one. It may come in the dead of night in your own home, burglars for instance; or on a lonely road or street after dark, or in daylight at the hands of passing bullies.

**Suppose it should come to you tonight, what could you do?**

Can't you see that it would not be just a question of bravery or strength but rather a question of whether you know how to box; how to defend yourself against the vicious blows of your assailant; how to disarm him if he tries to use a weapon; how to break his grip on your throat; how to stop the kick he launches at your stomach, and how to cripple him by a jiu-jitsu or bone-breaking hold?

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Clear—concise—complete; no music needed; everything made easy; thousands taught successfully. I teach well known Society Leaders and dancing experts. I can teach **you** in your spare time.

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Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

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- ☐ Electric Lighting and Railways
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- ☐ ARCHITECT
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- ☐ TRAFFIC MANAGER
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- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
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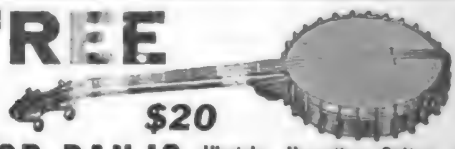

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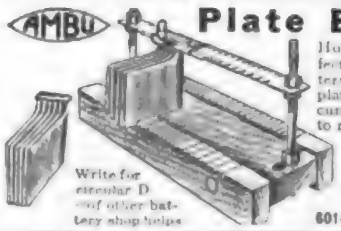

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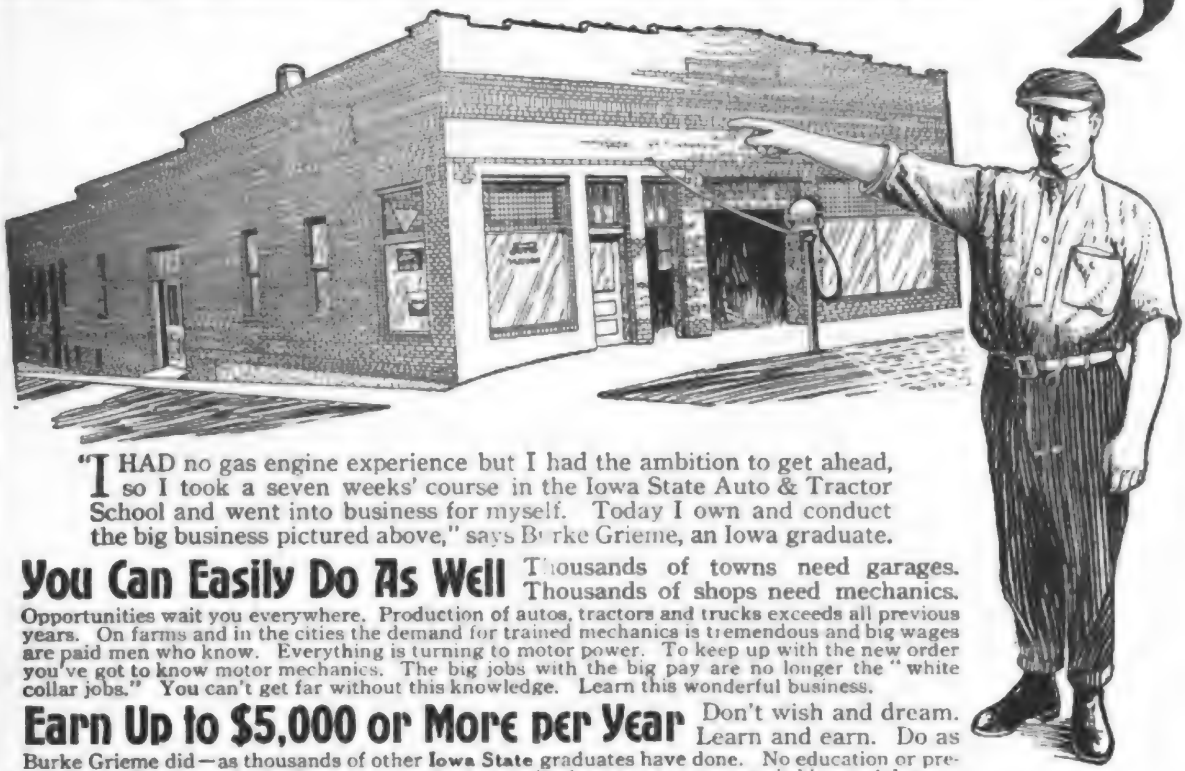

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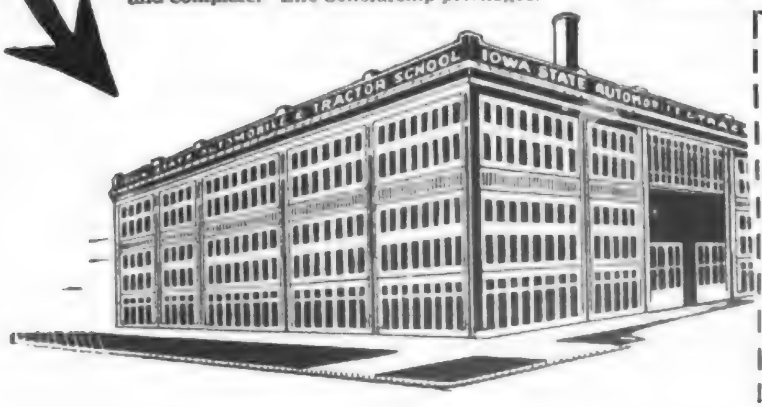


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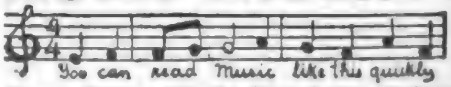


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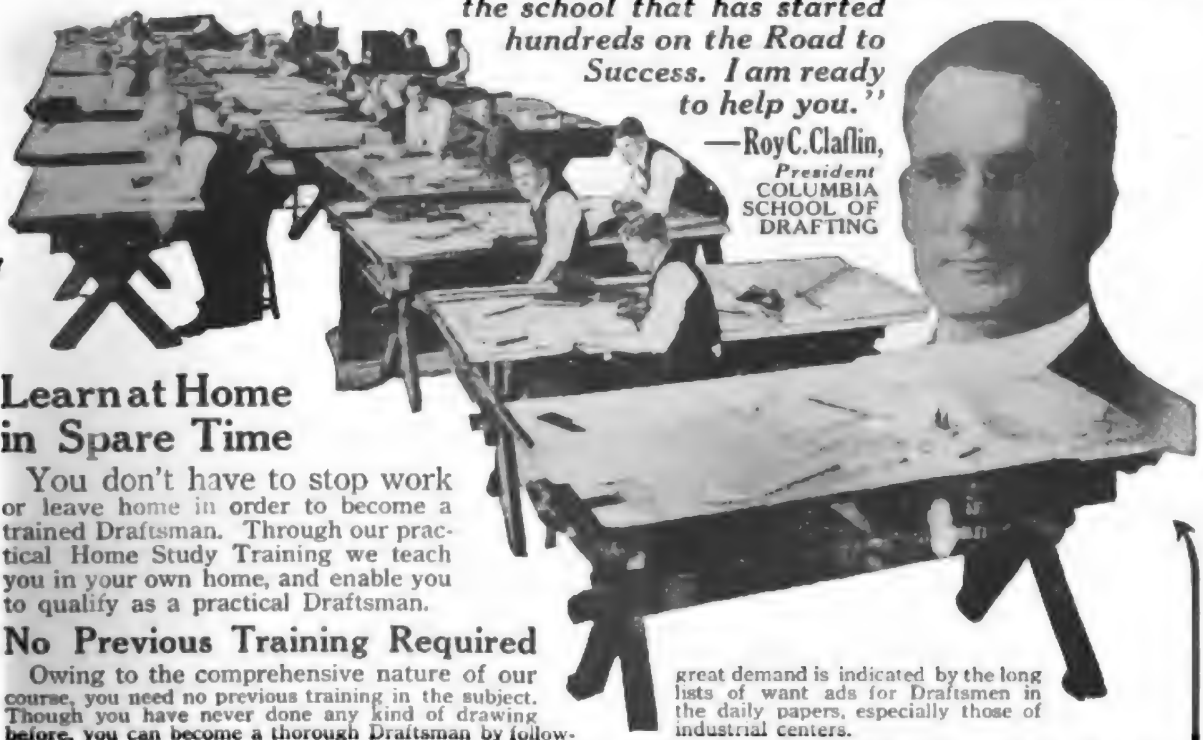

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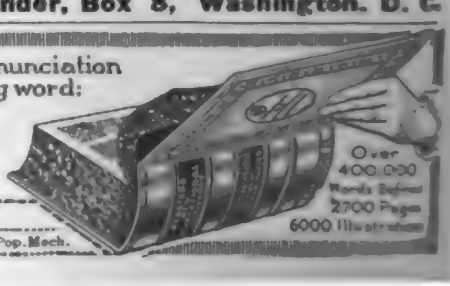


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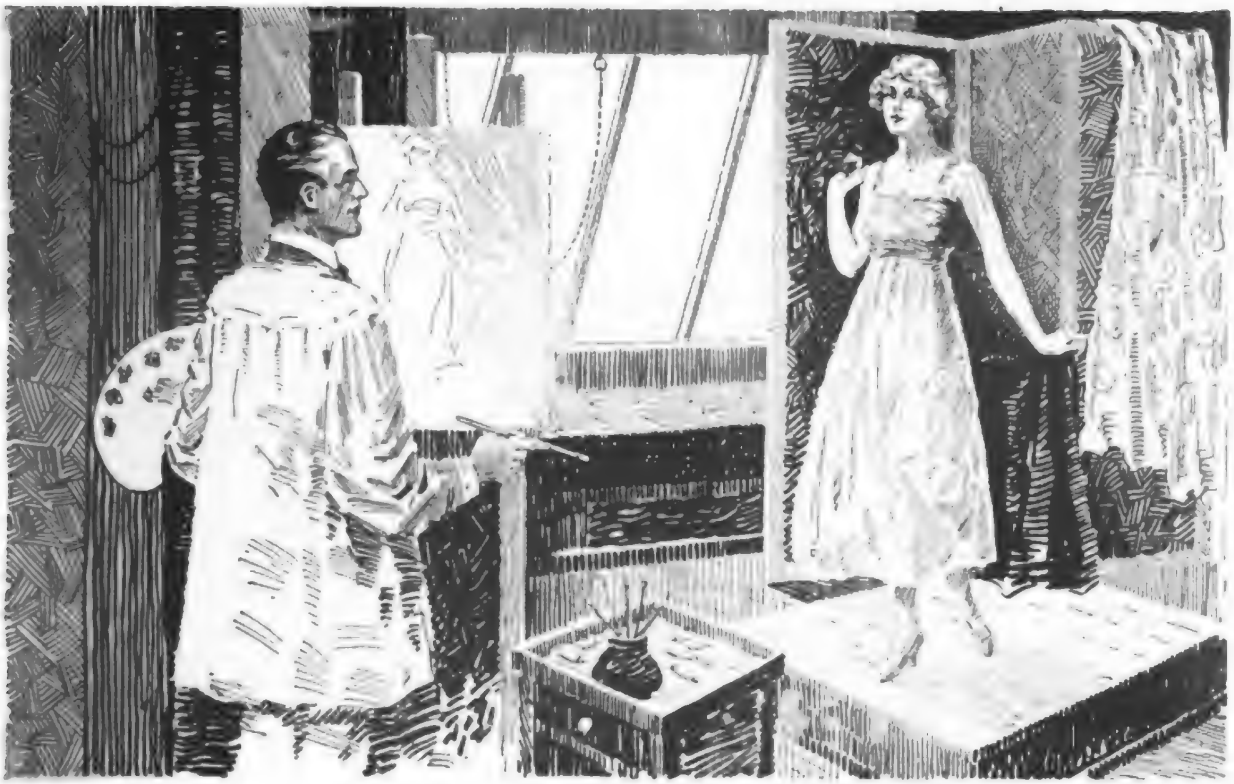

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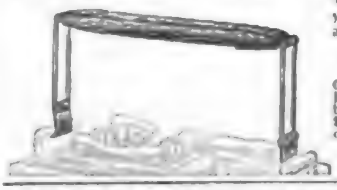

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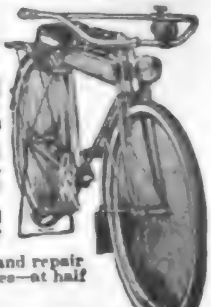

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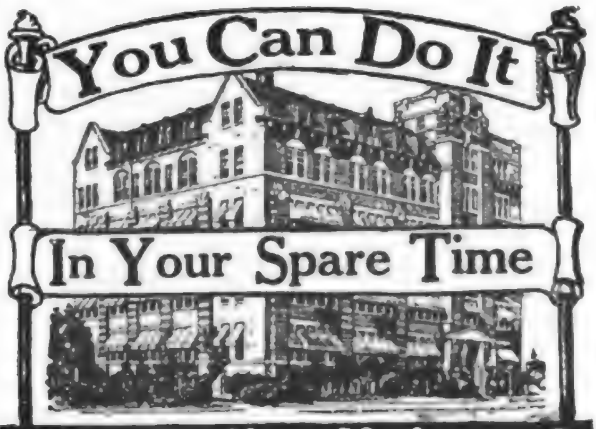


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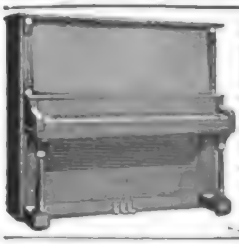

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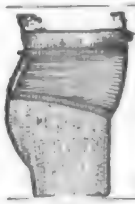

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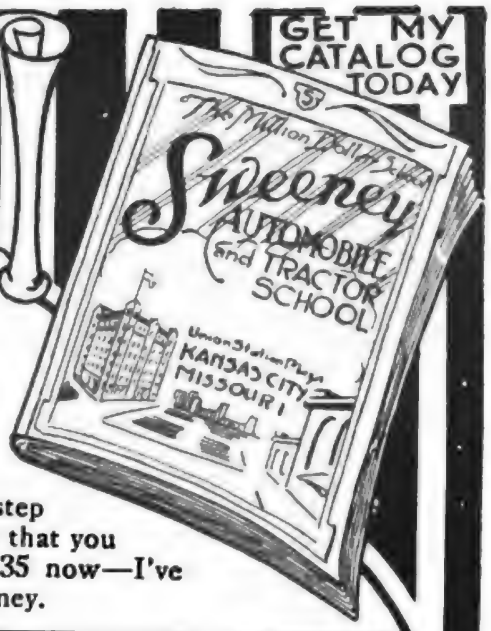


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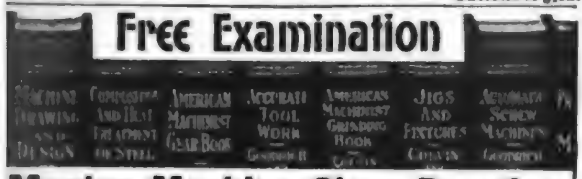

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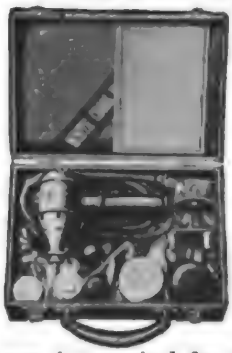

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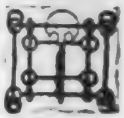

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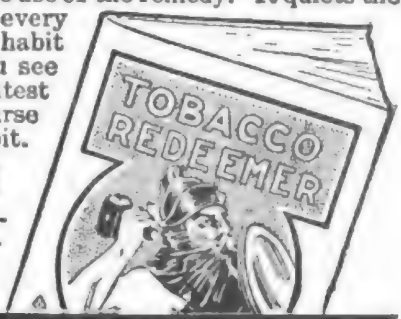


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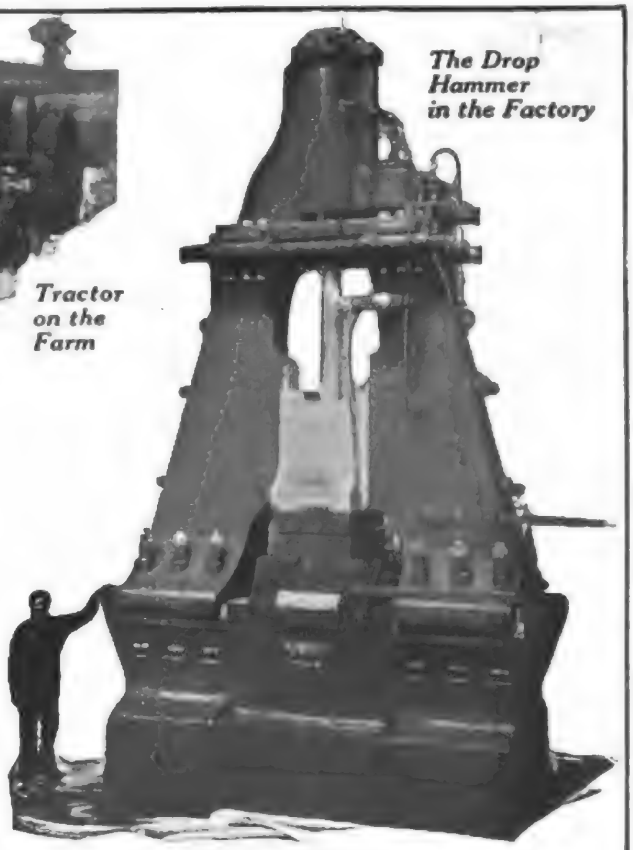

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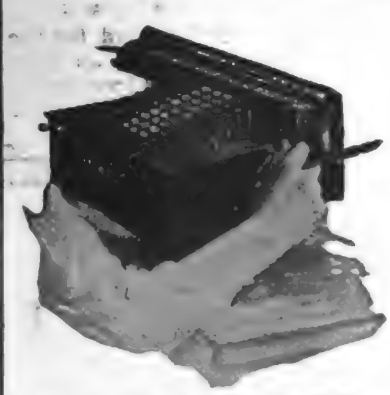

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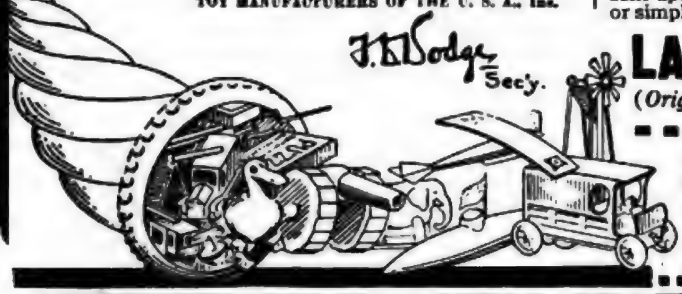

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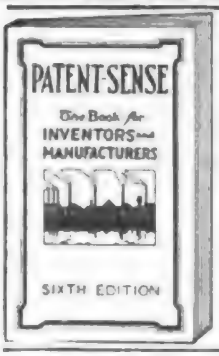


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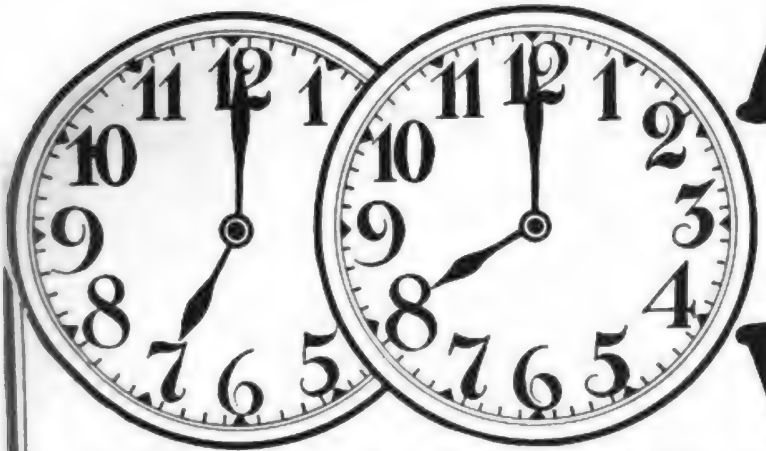

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Has automatic Air Cushions. Binds and draws the broken parts together as you would a broken limb. No salves. No lies. Durable, cheap. Sent on trial to prove it. Protected by U. S. patents. Catalog and measure blanks mailed free. Send name and address today.

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Your legs will appear straight when you wear

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Combination hose-supporter and pantleg straightener. **Quickly adjusted to fit various degrees of bowlegs;** as easy to put on and comfortable to wear as any ordinary garter—**no harness or padded forms;** just an ingenious special garter for bowlegged men—improves appearance wonderfully. Wearers are enthusiastic. You will be too. Write for free booklet, mailed in plain envelope.

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# Millions of People Can Write Stories and Photoplays and Don't Know It!

THIS is the startling assertion recently made by E. B. Davison of New York, one of the highest paid writers in the world. Is his astonishing statement true? Can it be possible there are countless thousands of people yearning to write, who really *can* and simply *haven't found it out?* Well, come to think of it, most anybody can *tell* a story. Why can't most anybody *write* a story? Why is writing supposed to be a rare gift that few possess? Isn't this only another of the Mistaken Ideas the past has handed down to us? Yesterday nobody dreamed man could fly. To-day he dives like a swallow ten thousand feet above the earth and laughs down at the tiny mortal atoms of his fellow-men below! So Yesterday's "impossibility" is a reality to-day.

"The time will come," writes the same authority, "when millions of people will be writers—there will be countless thousands of playwrights, novelists, scenario, magazine and newspaper writers—they are coming, coming—a whole new world of them!" And do you know what these writers-to-be are doing now? Why, they are the men—armies of them—young and old, now doing mere clerical work, in offices, keeping books, selling merchandise, or even driving trucks, running elevators, street cars, waiting on tables, working at barber chairs, following the plow, or teaching schools in the rural districts; and women, young and old, by scores, now pounding typewriters, or standing behind counters, or running spindles in factories, bending over sewing machines, or doing housework. Yes—you may laugh—but these are The Writers of To-morrow.

For writing isn't only for geniuses as most people think. *Don't you believe the Creator gave you a story-writing faculty just as He did the greatest writer?* Only maybe you thought that you "haven't the gift." Many people are simply "bluffed" by the are simply afraid to try. Or if they do try and their first efforts don't satisfy, they simply give up in despair, and that ends it. They're through. They never try again. Yet if, by some lucky chance they had first learned the simple rules of writing, and then given the Imagination free rein, they might have astonished the world!

But two things are essential in order to become a writer. First, to learn the ordinary principles of writing. Second, to learn to exercise your faculty of Thinking. By exercising a thing you develop it. Your Imagination is something like your right arm. The more you use it the stronger it gets. The principles of writing are no more complex than the principles of spelling, arithmetic, or any other simple thing that anybody knows. Writers learn to piece together a story as easily as a child sets up a miniature house with his toy blocks. It is amazingly easy after the mind grasps the simple "know how." A little study, a little patience, a little confidence, and the thing that looks hard turns out to be just as easy as it seemed difficult.

Thousands of people imagine they need a fine education in order to write. Nothing is farther from the truth. The greatest writers were the poorest scholars. People rarely learn to write at schools. They may get the principles there, but they *really learn to write* from the great, wide, open, boundless Book of Humanity! Yes, seething all around you, every day, every hour, every minute, in the whirling vortex—the flotsam and jetsam of Life—even in your own home, at work or play, are endless incidents for stories and plays—a wealth of material, a world of things happening. Every one of these has the seed of a story or play in it. Think! If you went to a fire, or saw an accident, you could come home and tell the folks all about it. Unconsciously you would describe it all very realistically. And if somebody stood by and wrote down exactly what you said, you'd be amazed to find your story would sound just as interesting as many you've read in magazines or seen on the screen. Now, you will naturally say, "Well, if Writing is as simple as you say it is, why can't *I* learn to write?" *Who says you can't?*

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Miss Helene Chadwick, versatile screen star, now leading lady for Tom Moore of Goldwyn Film Company, says:

*"Any man or woman who will learn this New Method of Writing ought to sell stories and plays with ease."*

Listen! A wonderful *free* book has recently been written on this very subject—a book that tells all about a Startling New Easy Method of Writing Stories and Photoplays—the wonderful Irving System. This amazing book, called *"The Wonder Book for Writers,"* shows how easily stories and plays are conceived, written, perfected, sold. How many who don't *dream* they can write, suddenly find it out. How the Scenario Kings and the Story Queens live and work. How bright men and women, without any special experience, learn to their own amazement that their simplest ideas may furnish brilliant plots for Plays and Stories. How one's own Imagination may provide an endless gold-mine of ideas that bring Happy Success and Handsome Cash Royalties. How new writers get their names into print. How to tell if you *are* a writer. How to develop your "story fancy," weave clever word-pictures and unique, thrilling, realistic plots. How your friends may be your worst judges. How to avoid discouragement and the pitfalls of Failure. How to *win!*

This surprising book is **absolutely free.** No charge. No obligation. Your copy is waiting for you. Write for it **now. Get it. It's yours.** Then you can pour your whole soul into this magic new enchantment that has come into your life—**story and play writing.** The lure of it, the love of it, the luxury of it will fill your wasted hours and dull moments with profit and pleasure. You will have this noble, absorbing, money-making new profession! And all in your spare time, without interfering with your regular job. Who says you can't make "easy money" with your brain! Who says you can't turn your Thoughts into cash! Who says you can't make your dreams come true! Nobody knows—**but the book will tell you.**

So why waste any more time wondering, dreaming, waiting? **Simply** fill out the coupon below—you're not **buying** anything, you're getting it **absolutely free.** A book that may prove the Book of Your Destiny. A Magic Book through which men and women young and old may learn to turn their spare hours into cash!

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"With this volume before him the veriest novice should be able to build stories or photoplays that will find a ready market. The best treatise of its kind I have encountered in 24 years of newspaper and literary work."—H. PIERCE WELLER, MANAGING EDITOR *The Binghamton Press.*

"When I first saw your ad I was working in a shop for $30 a week. Always having worked with my hands, I doubted my ability to make money with my brain. So it was with much skepticism that I sent for your Easy Method of Writing. When the System arrived, I carefully studied it evenings after work. Within a month I had completed two plays, one of which sold for $500, the other for $450. I unhesitatingly say that I owe it all to the Irving System."—HELEN KINDON, ATLANTIC CITY, N. J.

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**Conserve Your Health and Efficiency First**

**"I Would Not Part with it for $10,000"**

So writes an enthusiastic, grateful customer. "Worth more than a farm," says another. In like manner testify over 100,000 people who have worn it.

## The Natural Body Brace

Overcomes WEAKNESS and ORGANIC AILMENTS of WOMEN AND MEN. Develops **erect**, graceful figure.

Brings restful relief, comfort, ability to do things, health and strength.

**Wear It 30 Days Free at Our Expense**

Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness, ruptures, constipation, after effects of flu. Comfortable and easy to wear.

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# STOP USING A TRUSS

**Do Away With Steel And Rubber Bands**

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Inner surface is made adhesive to secure the PLAPAO-PAD firmly to the body, keeping the PLAPAO continually applied and the pad from slipping. No straps, buckles or springs attached. Soft as velvet—easy to apply.

It's the Non-Slipping, yet Non-Rigid Pad and What is Within It That Counts

**FREE to 5,000 Truss Sufferers**

To the extent of 5,000 sufferers who may apply I will send, ABSOLUTELY FREE, a sufficient quantity of the Plapao to positively convince them that this is the only logical, common-sense way of treating rupture. Plapao is a highly astringent medication placed within the Plapao-Pad and being absorbed through the skin, creates a wonderful feeling of relief and at the same time tends to strengthen the weakened muscles and thus permanently close the rupture opening. The process of recovery is natural, so you'll have no use for a truss—you can throw it away forever! Old and young have testified under oath that the Plapao-Pads cured their rupture—many of them long-standing, aggravated cases—without delay from work. Patent allowed in U. S. and foreign countries. Awarded Gold Medal at Rome and Grand Prix at Paris.

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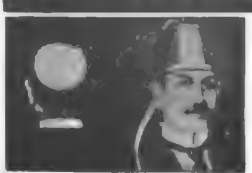

WHEN our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR," sent sealed in plain envelope, FREE.

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# The Amazing Book GUIDE TO "The Winning Personality" Given to You FREE

FRANK A. VANDERLIP

Mr. Vanderlip rose from a poor boy to the proud position of President of The National City Bank of New York, and is one of America's greatest financiers. In his selection of men, it was his boast that he rarely was deceived in looking first for A WINNING PERSONALITY, and afterward for the necessary attributes that a man must possess who was called upon to hold a position of trust and responsibility under his direction. He made WINNING PERSONALITY sell the man to him, knowing it would work equally well in the man's dealings with those with whom he came in contact; it would sell him to others. He proved that his theory was correct.

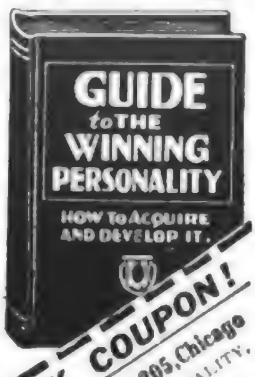
*This Talk is Only For Men Who Want to Enter the GET-THERE Class*

*You know*—everybody knows—that the men in the other class never get anywhere. They are apt to be found sitting on the SIDE LINES in the great game of life, trying to decide *for themselves* whether it's LUCK, PULL, ACCIDENT or MONEY that permits some men to climb so high up on the ladder of success. But big, successful men—like Frank A. Vanderlip—would say that while the elements of luck, pull, accident or money might have some bearing on the matter, the man with THE WINNING PERSONALITY was the one who made the greatest success in the struggle to get there, and win the favor of the world and the higher-up jobs. He said one time, in answer to the question how he picked men, "A WINNING PERSONALITY is the first thing I look for in a man."

A man who had so many men under him should know how important this trait is in a man who has his way to make in his journey success-ward, as most men have. He would tell you also that this is something that is born in every man. It is only waiting to be brought out, providing he starts right. And to be sure of the right start, we say to you, send for that amazing book

## Guide to THE WINNING PERSONALITY

and read it carefully. You will say it is the most fascinating, the most intensely interesting and profitable book that ever came into your hands. You will hate to lay it down. Just a simple request will bring a copy to you, quickly.




### Some of the Topics

- What is a magnetic personality?
- Winning Ways
- The Secret of Leadership
- The Value of Attractive Personality
- The Cultivation of Personality
- The Knowledge that is Power
- The "Awakening of the Will"
- Physical Poise and Carriage
- The Way to Carry Yourself
- The Secret of Grace in Walking
- Psychological Effect of Good Carriage
- The Way of the Gentleman
- The Little Things that Count
- How Some People "Queer" Themselves
- Lord Chesterfield's Advice
- The Value of an Attractive Voice
- Making Over One's Voice
- The Value of Effective Expression
- What Constitutes Strength and Force in Words
- The Person Who is Always Interesting
- Good Manners
- Advice of the Worldly Wise
- Personality Pointers
- Reading Personality in the Eyes
- How to Acquire the Winning Handshake
- The Secret of Obtaining the Confidence of Men
- General Advice to Student on How to Develop The Winning Personality

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This is the only plan we have of making the acquaintance of men of ambition—men of your calibre, at long range. Ask for this FREE BOOK now, TODAY. It's a little step to take, but one that leads to the goal of success, and YOU (and others) who are heading in that direction want all the worth-while help that's FREE.

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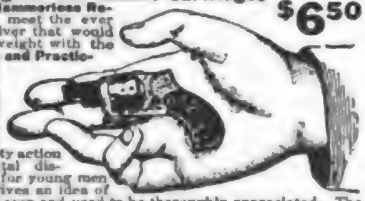
## "The Baby" Double Action Hammerless Revolver

**A Handsome and Most Effective Weapon. Measures but 4¼ Inches Long. Takes Regular .22 Calibre Cartridges**

**$6.50**



The new Baby Double Action Hammerless Revolver has been produced to meet the ever increasing demand for a revolver that would combine small size and right weight with the essential features of Efficiency and Practicability. It is small in size, yet is just as effective and serviceable as the most expensive weapon you can buy. Everyone should have a revolver and should know how to use it, and there is no safer or better one made than this. A great feature is its safety action that guards against accidental discharge, making it quite safe for young men and ladies. The illustration gives an idea of its appearance, but it must be seen and used to be thoroughly appreciated. The ammunition used is the standard 22-calibre cartridge obtainable anywhere. The operation of the charging mechanism is extremely rapid and absolutely reliable; six well aimed shots can be fired in as many seconds. The revolver is very well constructed, with finest nickel plated fluted barrel of cylinder, and it weighs only 4½ ounces. The price of the Baby Revolver is only $6.50 sent by mail, p.pd. to any address.

## MIDGET BIBLE

**The Smallest Bible in the World**

The Midget Bible is a perfect gem, and a work of art. It is about the size of a postage stamp and contains TWO HUNDRED PAGES of the NEW TESTAMENT. This little Bible is a wonder. It is said to bring good luck to the owner. Must be seen to be appreciated. **Price, only 15 cents, three Bibles for 40 cents; one dozen Bibles for $1.20; 100 for $7.50.** Good money selling Bibles.

**JOHNSON SMITH & CO., Dept. PM13, 3224 North Halsted Street, CHICAGO**

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**It goes with real Yankee Pep—by its own power**

**MADE OF METAL, IN CAMOUFLAGED COLORS OR GRAY**

Most remarkable Toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts; it will go backward or forward at will, and altogether will give you more fun and amusement than any other toy yet brought out. 24 inches long. Each packed in colored box. **Price only 35 cents postpaid, three for One Dollar, or $3.00 by the dozen, postpaid** to any address in the world. **Johnson Smith & Co.**

## MAGIC FLUTE

**Wonderfully Sweet Toned and Musical**

Post Paid **15c**

A marvelous musical instrument. No other instrument produces sweeter music, whether it be the joyous notes of a quickstep or the solemn strains of a church hymn in fact, any class of music can be played upon the Humanatone without practice, as it is almost a self-playing instrument. When played with a piano accompaniment, or any other musical instrument, the effect is charming.

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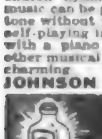
## Good Luck Ring

**Quaint and Novel Design**

A VERY striking and uncommon ring. Silver finish, skull and crossbone design, with two brilliant, flashing gems sparkling out of the eyes. Said by many to bring Good Luck to the wearer, hence its name, **Good Luck Ring.** Very unique ring that you will take a pride in wearing. **ONLY 25 CENTS.**

## LUMINOUS PAINT



**Make Your Watches, Clocks, Etc., Visible by Night** The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, **price 25c.** Larger sizes, 50c and $1 postpaid.

## Mystic Skeleton

**10c** ppd.

A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it.

## Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most lifelike manner. **Price per box, 10c ppd.**

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| Automobile Puzzle (Latest) | 20c | Imitation Gold Teeth . . . 8 for | 10c |
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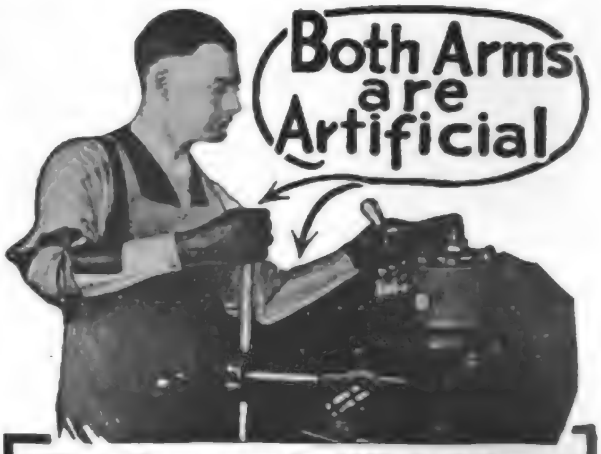


## The Carnes Artificial Arm

has enabled Edward Finnegan, 413 Olive St., Kansas City, Mo., to continue his work as a skilled mechanic, altho he has lost both arms. His earning power is the same, his efficiency practically as high. To see him work or on the street, you would never think that both arms were artificial. This is because the Carnes Artificial Arms which he wears are inconspicuous, natural in appearance, strong and serviceable.

The Carnes Arm is totally unlike any other. It is the only arm that is practical and useful, and at the same time does not proclaim itself as being artificial. Its wearers are able to continue their ordinary occupations, wait on and care for themselves.

**Catalog Free** We will cheerfully send you our catalog, which fully explains the Carnes Artificial Arm and shows by actual photographs how Salesmen, Mechanics, Farmers, etc., are able to use it in their regular occupations. Write for a copy today.

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## "BOW LEGS and KNOCK-KNEES" UNSIGHTLY

**SEND FOR BOOKLET SHOWING PHOTOS OF MEN WITH AND WITHOUT THE PERFECT LEG FORMS**

**PERFECT SALES CO.**
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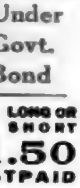

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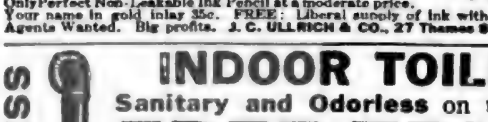


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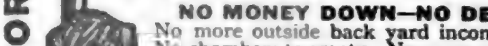

**$1.50 POSTPAID**

Only Perfect Non-Leakable Ink Pencil at a moderate price. Your name in gold inlay 35c. FREE: Liberal supply of ink with retail orders. Agents Wanted. Big profits. **J. C. ULLRICH & CO., 27 Thames St., NEW YORK**

## INDOOR TOILET

**Sanitary and Odorless on ten days'**

## FREE TRIAL

**NO MONEY DOWN—NO DEPOSIT**

No more outside back yard inconveniences. No chambers to empty. No sewer or cesspool. Chemical process dissolves human waste in water. No trouble. Kills disease germs. Prevents flies, filth and bad odors of outhouse. A real necessity for old, young or invalids. Preserves health.

**Costs 1 Cent a Week to Operate per Person**

Place in any room, hall or closet. No trouble to install. Guaranteed sanitary and odorless. Endorsed by thousands of users, doctors, sanitary experts, health boards, etc. **AGENTS WANTED.**

**Kawneer Cabinet Co.**
**876 Kawneer Bldg., Kansas City, Mo.**

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# The Man Who *Wouldn't* Stay Down

He was putting in long hours at monotonous unskilled work. His small pay scarcely lasted from one week to the next. Pleasures were few and far between and he couldn't save a cent.

He was down—but he *wouldn't stay there!* He saw other men promoted, and he made up his mind that what they could do *he* could do. Then he found the *reason* they were promoted was because they had special training—an expert knowledge of some one line. So he made up his mind that *he* would get that kind of training.

He marked and mailed to Scranton a coupon like the one below. That was his first step upward. It brought him just the information he was looking for. He found he could get the training he needed right at home in the hours after supper. From that time on he spent part of his spare time studying.

The first reward was not long in coming—an increase in salary. Then came another. Then he was made Foreman. Now he is Superintendent with an income that means independence and all the comforts and pleasures that make life worth living.

It just shows what a man with ambition can do. And this man is only one out of hundreds of thousands who have climbed the same steps to success with the help of the International Correspondence Schools.

## What about *you?*

Are you satisfied merely to hang on where you are or would you, too, like to have a real job and real money? It's entirely up to you. You don't *have* to stay down. You *can* climb to the position you want in the work you like best. Yes, you can! The I. C. S. is ready and anxious to come to you, wherever you are, with the very help you need.

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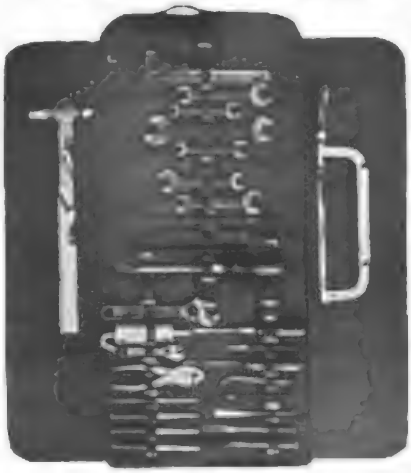

### Special Offer

Everyone who enrolls now will receive a new kit of 29 tools without any charge whatever. These are not loaned but are actually yours to take home with you when you leave the school. There are no strings tied to this offer. This fine set of tools and kit bag are worth fully $17.50.

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***Write To-day***

Send for our new free book entitled "Making You Master of the Auto." Learn how we teach all the everyday problems concerning automobile and tractor engines—ignition, starting and lighting systems, magnetos, carburetors, etc. *Write today.*

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DIAMOND-LAKE 10-ACRE FARM, with two-room house, good well, purest water, 100 chickens, plenty small fruit, etc. Sand loam soil, not only good for fruits and vegetables, but for corn, potatoes, etc. All level, not much cleared, balance mostly pine and oak woods. Near **Diamond Lake,** with its many fine resorts, only 7 miles from White Cloud, the county seat, 4 miles from the R. R. at Ramona, Michigan, making good markets.

**Price is only $565 with all improvements.**

**FEDERAL REALTY CO.**
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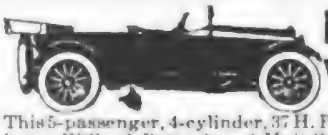

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# There Is Your Field—TRAFFIC

**You need not look far for a chance to rise to a higher position—to make more money. When all great industries—manufacturers, railroads, steamship companies, packing houses, mills, mines, chambers of commerce, municipalities—are calling for traffic experts, you can take your place among the big pay men, if you will learn the ins and outs of Interstate Commerce—know how to direct shipments in vast volumes, by freight, express, parcels post.**

**Commerce is speeding up as never before. The United States must supply the world—which means carloads, train loads, ship loads, moving constantly. Not enough men are available who know rates, classifications, legal points and organization of traffic departments. The need is pressing today—tomorrow will bring a still more insistent demand. No reason why you should stand waiting for a chance. The chance is here. You need only the training to make you the man that these great shippers are looking for, willing, ready to pay you a high salary, to place you in a position of responsibility.**

## Train by Mail

Hold your present job. You can become a Traffic Expert in your spare time thru LaSalle training. Use your odd hours to capitalize yourself—to master a paying profession—to step far ahead quickly. Specialists are the men who win today—and Traffic is a specialized calling as yet uncrowded. Really no competition for the thoroly trained man—opportunities always open.

**The LaSalle experts are ready now to give you this training—to make you a master of every vital point in traffic management. They will post you on the practical working of the methods used by leading shippers, instruct you in Interstate Commerce Law, show you how to figure rates, determine classifications and get the goods to destination at lowest cost. It's easy to see how any man can increase his earning power by getting this knowledge. You can pay the moderate fee, a little each month as you go along.**

## Note What These Men Have Done

Fred Hoffman's salary increased 500%, Harold Watson's report of 400% advance, R. W. Smallwood's two promotions, B. S. McMullen's rise from freight checker to General Freight Agent and hundreds of other successes made by LaSalle trained traffic men are all the proof needed that you too can push rapidly forward if you have this training.

LaSalle has already helped over 160,000 men to be better business specialists. Every year its experts train 30,000 ambitious men for higher positions. Many great American corporations employ LaSalle men in responsible positions. The Pennsylvania R. R. has over 2100, American Telegraph & Telephone Co. 811, B. & O. R. R. 946, Standard Oil Co. 390, while scores of others employ from 50 to 100 LaSalle trained men.

## Mail Coupon — Get the Facts

Catalogs, information about the opportunities in Traffic and detailed facts about LaSalle training are ready to be mailed the day your request arrives. Send the coupon or write a letter. No obligation upon you is implied. This information is given freely. And we will also send, without cost, "Ten Years' Promotion in One"—the book that has been an inspiration and help to thousands of ambitious men. It may be a great help to you, too. Just tell us where to mail it.

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Please send me your catalog and full information on your Course and Consulting Service in Interstate Commerce and Traffic Management. Also a copy of your valuable book for the ambitious man, "Ten Years' Promotion in One." This without obligation on my part.

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# More Big Jobs Open to TRAFFIC MEN!

The wheels of peace-time industry never turned faster than they do to-day. Reconstruction work in Europe and expansion in foreign trade are taxing America's transportation facilities to the breaking point. Great factories are straining machine and man to supply the products for world-wide trade. Our ships are racing the seas by night and day and railroads speeding feverishly to haul the goods to market. Traffic Men—trained, with expert knowledge—are needed to guide and direct this great flow of traffic through the quickest, least costly routes.

## Earn Big Salaries

Men trained in Regulated Transportation and Shipping, who can efficiently and economically direct transportation from inland cities to the markets all over the world, can almost name their own salaries. There never was a more opportune time to enter this fascinating, high salaried profession. The man who knows about the intricate Rules and Laws of Interstate Commerce, about demurrage, service, routings, classifications, marine insurance, etc., can save his firm thousands of dollars in shipping charges. That's why he is paid big money.

Manufacturers, jobbers, ship owners and railroads are all calling for efficient traffic men. For every hundred needed, only one is available. It is an uncrowded calling in which ambitious men may rise to enviable success.

## You Train at Home in Spare Time

You can qualify at home, in spare time, for one of these big positions. The American Commerce Association—a national organization of traffic experts—will teach you while you hold your present job. Men skilled in every phase of traffic work will train you step by step. They will equip you with a thorough knowledge of Rates, Classifications, Routings, Claims, Demurrage, Ocean Traffic, Regulation and Management, Interstate Commerce Rulings, etc., etc. Under their guidance, you will master traffic problems with ease and accuracy. In addition to this, privilege is granted members to consult with the Association's Traffic Advisory Council, composed of many of the foremost Traffic Managers and Railroad Men of the country.

## The Cost Is Small

The cost of the Training is remarkably small. Many members have more than paid for it from immediate increases in earnings. If you desire, you may enroll under our easy payment plan—a little each month, only a few cents a day. No ambitious man but can afford it.

## Write for Free Book

"Opportunities and Requirements For Traffic Work" is a little volume that explains this exceptional training service in detail. It names the personnel of this great organization of practical traffic men. It recites many stories of striking success of men who have taken the work. It teems with facts of absorbing interest to those who determine to leave behind the crowd of smaller men and rise on up to success and happiness. If you seriously want to earn a salary of $2,500 to $10,000 a year or more, you will delay not a moment in sending for this valuable book. Write now. Only action wins! Postponements usually end in post mortems! In writing, state your age, present occupation and whether or not you have had previous traffic experience. Address: American Commerce Association, Dept. 1012, 206 South Wabash Ave., Chicago, Ills.

# *Who Kicked The First Goal In America?*

Get it right! Don't be a goof when you talk about football. Let 'em know you know who kicked the first goal in America, who made the first touchdown, who put the scrim in scrimmage, who lost the first ear in the history of the sport—and why they call it a sport. Half the fun in watching a game of football is in letting folks hear you knock the plays. So draw up alongside the December number of

# CARTOONS MAGAZINE

and read a lot of facts about the origin of football, and why no Thanksgiving is complete without a list of casualties as long as the Democratic ballot in Baton Rouge. The article is written by Malone Farrel, and will be found on page 895.

**Hep yourself to Malone's chatter and see how wise you'll feel**

**The price of CARTOONS MAGAZINE is 25 cents a copy, or $3.00 a year, at your newsdealer's, or send us the attached coupon, with 25 cents in stamps or coin, and receive a sample copy. The magazine will do the rest.**

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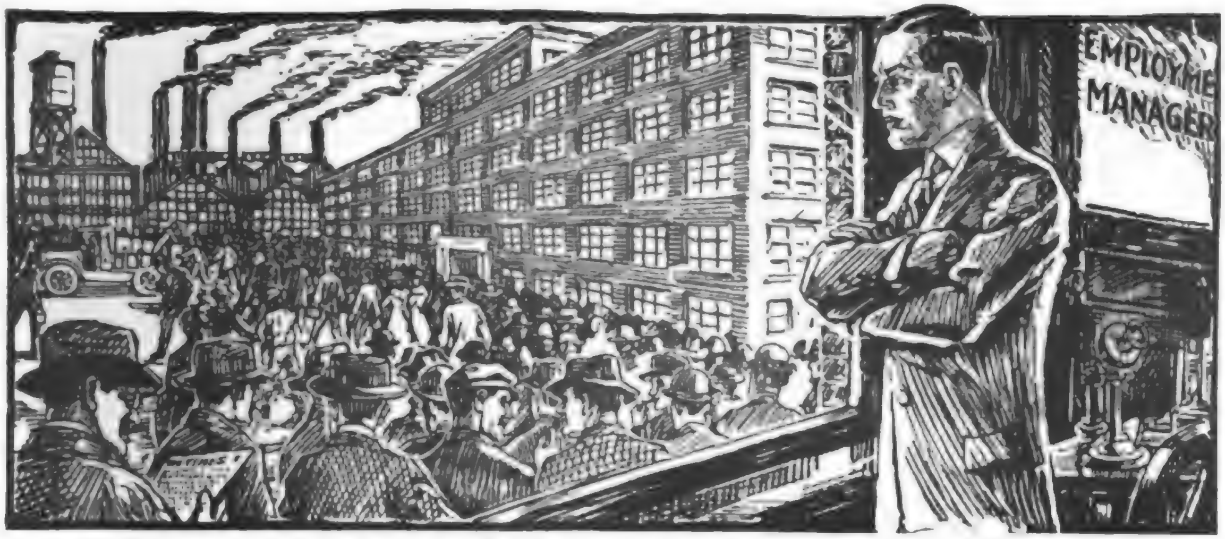


# It's EASY to HIRE—
# —but COSTLY to FIRE

WHEN leading industrial experts a few years ago came out with facts and figures to prove that it cost anywhere from $25.00 to $1,000.00 to replace a trained worker—that indiscriminate hiring and firing was a waste of human material and profits—that employment functions vested entirely in departmental heads was costly—and that conservation of man-power was not only economical but an efficiency factor, the employer began to think and to figure with the result that centralized employment departments came into existence—thereby creating a new profession—employment management

## The Employment Manager's Big Problem

The employment manager does not earn his salary simply by hiring, but by reducing the number of misfits and quits. Therein lies his big problem. To maintain a stable working force he must, by judicious selection, find the right man for the right job for the right boss. He must know the requirements of these jobs and how to keep round pegs out of square holes. This demands an intimate knowledge of departmental requirements and an understanding of labor policies. He must buy his help with just as much care as the purchasing agent buys raw material. Employment management today is a study of human engineering. It is a real man's job.

## Expert Help for Employment Men

With the approval and co-operation of many of the leading industrial concerns, employment managers and safety engineers, the American School of Correspondence has prepared EMPLOYMENT MANAGEMENT AND SAFETY ENGINEERING.

This course, which has been endorsed by Manufacturers and Employment Associations is now off the press and ready to help you solve your problems in this field.

EMPLOYMENT MANAGEMENT AND SAFETY ENGINEERING represents the result of over two years investigation and intimate study of every phase of employment and safety. Scores of plants all over the country provided valuable data, proved plans, methods and systems.

The course offers you nothing but EXPERIENCE. The knowledge to be gained from it would take years to acquire—because it stands for years of practical experience, investigation and research.

## A Practical Reading Course

EMPLOYMENT MANAGEMENT and SAFETY ENGINEERING comprises a total of over 1500 pages—including a large and valuable collection of employment forms, charts, statistical tables, half-tone illustrations and engravings, and is neatly bound in flexible binding. It presents proved facts; not theories; discusses plans and policies frankly, but without bias; and gives concrete and practical information on such important problems as follows:

EMPLOYMENT MANAGEMENT:
The Employment Field—Organizing a Department—Functions and Personnel
Job Analysis — Sources of Labor
Safeguarding Selection
Training New Workers — Systems and Policies
Employment Forms — Personal Follow-Up
Labor Turnover — Collective Bargaining

MUTUAL RELATIONS: (including)
Personal Service Work
Lunch Rooms and Commissaries
Housing and Transportation Problems
Employe Representation — House Organs

INDUSTRIAL INSURANCE: (including)
Employes' Benefit Associations
Service Bonus Plans—Insurance Plans
Savings and Loan Club
Medical Service — Legal Phases
The 100% Employment Manager
The Employment Bibliography

SAFETY ENGINEERING:
The Human Element — Power Equipment
The Accident Problem — Gen. Eng'ring Features
Mechanical Guarding — Special Features

EMPLOYMENT MANAGEMENT and SAFETY ENGINEERING show how the plans and policies discussed can be applied to personnel problems in concerns employing any number of men from 500 up, and engaged in any form of industry.

## Send No Money

There is only one way to appreciate the great value of EMPLOYMENT MANAGEMENT AND ENGINEERING, and that is to examine it yourself. Let us send it to you, without any cost or obligation on your part. Keep it SEVEN DAYS before deciding whether you can afford to be without it. Send no money—just fill in the coupon and mail it.

**AMERICAN SCHOOL OF CORRESPONDENCE**
**Chicago, Illinois**

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*Dept. E-749 Chicago, Illinois*

Please send me your complete Seven Volume reading course on EMPLOYMENT MANAGEMENT AND SAFETY ENGINEERING for seven days free examination, shipping charges collect. If I decide to buy, I will send $10.00 within seven days after receipt of books, and $10.00 a month until the full price of $50.00 has been paid. Should I decide not to keep the books I will return them at your expense.

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*"Out they came, the financier patting Preston on the shoulder in a fatherly sort of way. . . . 'Come to see me as often as you can, Mr. Preston, and remember that I'll back you to the limit.'"*

# The Most Convincing Talker I Ever Met

**Everywhere this man goes, people shower him with favors and seek his friendship. Things which other people ask for and are refused, he gets instantly. How he does it is told in this amazing story.**

LET me ask you this: There is a big business deal to be put through. It involves millions of dollars. Putting it through depends wholly on one thing—getting the backing of a great financier.

But this man is bitterly opposed to your idea and to your associates. Seven of the most able men and women in all America have tried to win over this financier. They failed dismally and completely.

Now, could you, a total stranger to this man, walk in on him unannounced, talk for less than an hour, and then have him take your arm as a token of friendship, and give you a signed letter agreeing to back you to the limit?

Could you?

---

ASTOUNDING? Yes! But it *WAS* done. And I'll tell you how. Here is the way it all came about. For a long time the directors of our company had felt the handicap of limited capital. We had business in sight running into a million dollars a month. But we couldn't finance this volume of sales. We simply had to get big backing, and that was all there was to it.

Because of trade affiliations, one man—a great financier in New York—controlled the situation. Win him over and the rest was easy. But how to win him?—that was the question. No less than five men and two women—all people of influence and reputation—had tried. They were all repulsed—turned down cold and flat.

You know how a thing of this sort grows on you and how bitter utter defeat is. Well, we were talking it over at a board meeting when one of our directors announced that he knew of only one man who could possibly put through the deal—a man by the name of Preston.

So it was agreed that Preston was to be sounded out at luncheon the following day. He proved to be a fine type of American. At 34 years of age he had become president and majority stockholder of a thriving manufacturing business rated at three-quarters of a million dollars.

Preston was deeply interested, as anyone would be over the prospect of closing such a big deal. The director in question said casually, "Why don't you run down to New York and take a shot at it, Preston?" Preston looked out of the window for a moment, and then quietly answered, "You're on."

---

I WENT along with Preston simply as a matter of form to represent our interests. Aboard the 10:25 train out of Chicago, we headed for the smoker and got to talking with the crowd there.

Then I noticed something. Preston had dominated them all. Everyone was eagerly hanging on his words, and looking at him with open admiration. No sooner would he stop talking than one of the men would start him up again. And as the men dropped off at stations along the way they gave Preston their cards, with pressing invitations to look them up. No doubt about it, Preston was *THE* man aboard that car.

The colored porter, too, came under his sway. For that night, when the berths were being made up, the porter came unasked to Preston, told him that his berth was right over the car trucks, and insisted upon changing it to a more comfortable one.

And so it went all the way to New York. Everyone who met Preston took a great liking to him the instant he spoke. They seemed to be eager for his companionship—wanted to be with him every minute, openly admired him, and loaded him with favors.

Even the usual haughty room clerk at the hotel showed a great interest in Preston's welfare. He showered us with attention while a long line of people waited to register.

The next morning we called on the great financier—the man who was so bitterly against us and had

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flatly turned down seven of our shrewd influential representatives.

I waited in the reception room—nervous, restless, with pins and needles running up and down my spine. Surely Preston would meet the same humiliating fate?

But no! In less than an hour out they came, the financier patting Preston on the shoulder in a fatherly sort of way. And then I heard the surprising words, "Come to see me as often as you can, Mr. Preston, *and remember that I'll back you to the limit!*"

---

AT the hotel that night sleep wouldn't come. I couldn't get the amazing Preston out of my thoughts. What an irresistible power over men's minds he had. Didn't even have to ask for what he wanted! People actually competed for his attention, anticipated his wishes and eagerly met them. What a man! What power! . . . Then the tremendous possibilities of it all—think what could be done with such power!

What was the secret? For secret there must be. So the first thing next morning I hurried to Preston's room, told him my thoughts, and asked him the secret of his power.

Preston laughed good-naturedly. "Nothing to it—I—well—that—is—" he stalled. "I don't like to talk about myself, but I've simply mastered the knack of talking convincingly, that's all."

"But how did you get the knack?" I persisted.

Preston smiled, and said, "Well, there's an organization in New York that tells you exactly how to do it. *It's amazing!* There's really nothing to study. It's mostly a knack which they tell you. You can learn this knack in a few hours. And in less than a week it will produce definite results in your daily work.

"Write to this organization—the Independent Corporation—and get their method. They send it on free trial. I'll wager that in a few weeks from now you'll have a power over men which you never thought possible . . . but write and see for yourself." And that was all I could get out of the amazing Preston.

---

WHEN I returned home I sent for the method Preston told me about. It opened my eyes and astounded me. Just how he had won over the financier was now as clear as day to me. I began to apply the method to my daily work, and soon I was able to wield the same remarkable power over men and women that Preston had. I don't like to talk about my personal achievements any more than Preston does, but I'll say this:

When you have acquired the knack of talking convincingly, it's easy to get people to do anything you want them to do. That's how Preston impressed those people on the train—how he got special attention from the hotel clerk—how he won over the financier—simply by talking convincingly.

This knack of talking convincingly will do wonders for any man or woman. Most people are afraid to express their thoughts; they know the humiliation of talking to people and of being ignored with a casual nod or a "yes" or "no." But when you can talk convincingly, it's different. *When you talk people listen and listen eagerly.* You can get people to do almost anything you want them to do. And the beauty of it all is that they think they are doing it of their own free will.

*"At luncheon one of our directors said, why don't you run down to New York and take a shot at it, Preston?" And Preston answered, "You're on!"*

In committee meetings, or in a crowd of any sort you can rivet the attention of all when you talk. You can force them to accept your ideas. It helps wonderfully in writing business letters—enables you to write sales letters that amaze everyone by the big orders they pull in.

Then again it helps in social life. Interesting and convincing talk is the basis of social success. At social affairs you'll always find that the convincing talker is the center of attraction, and that people go out of their way to "make up" to him.

Talk convincingly and no man—no matter who he is—will ever treat you with cold, unresponsive indifference. Instead you'll instantly get under his skin, make his heart glow and set fire to his enthusiasms. Talk convincingly and any man—even a stranger—will treat you like an old pal and will literally take the shirt off his back to please you.

*You can get anything you want if you know how to talk convincingly.* You've noticed that in business ability alone won't get you much. Many a man of real ability, who cannot express himself well, is often outdistanced by a man of mediocre ability who knows how to talk convincingly. There's no getting away from it, to get ahead—merely to hold your own—to get what your ability entitles you to, *you've got to know how to talk convincingly!*

---

THE method Preston told me about is Dr. Law's "Mastery of Speech," published by the Independent Corporation. Such confidence have the publishers in the ability of Dr. Law's method to make you a convincing talker that they will gladly send it to you wholly on approval.

You needn't send any money—not a cent. Merely mail the coupon, or write a letter, and the complete Course, "Mastery of Speech," will be sent you by return mail, all charges prepaid. If you are not entirely satisfied with it, send it back any time within five days after you receive it and you will owe nothing.

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# Shave a New Way

## —Easier, Quicker, Pleasanter

### *Then Compare It With the Old Way*

**Facts such as these convince the home shaver that harsh, slow ways are no longer necessary. Shavaid, the new, soothing beard-softener, replaces annoying and harmful operations, saves time, gives new delight. To learn its merit, send for a Free Trial Tube.**

HERE is a new, satisfying way to gain a comfort shave. A way now being adopted by men the nation over.

This welcome offering is Shavaid. It is a scientific preparation, perfected after countless experiments and tests.

It revolutionizes home shaving. It turns an irksome task into a refreshing pleasure. Once you try it you will never give it up.

### It Saves All This

Shavaid saves hot water applications. It saves rubbing the lather in. It saves waiting for the beard to soften. It saves doctoring an irritated skin with lotion afterwards. It means a quick shave, an easy shave, a luxury shave. It avoids discomforts in a close shave. It does instantly what old shaving methods never could do at all.

If all this is so, you want it. You will never shave without it. No man abuses his face willingly.

### Old vs. New

Simply coat the dry beard thinly with Shavaid, before applying lather. Note the cooling, soothing effect.

**Shavaid**

***Softens the beard instantly***
—apply to dry face before the lather.

***Saves time and trouble***
—no hot water, no "rubbing in" of the lather.

***Protects the face***
—skin remains firm and smooth

***Removes the razor "pull"***
—harsh ways age the skin prematurely.

***Replaces after-lotions***
—Shavaid is a cooling, soothing balm.

Note how the lather remains moist and creamy.

This way is quicker. Yet it protects the skin. Harsh treatments bring wrinkles too soon.

Hot water applications make the face tender and bring the blood to the surface. That causes abrasions.

With Shavaid, you can obtain a close shave without irritation. The Shavaid way keeps the skin firm and smooth.

The razor glides over easily.

And best of all, no lotions are necessary afterwards, for Shavaid is in itself a cooling, soothing, healing emollient. Its daily use keeps the cuticle in condition.

### See If You Agree

We realize in introducing such an innovation that the quickest way for it to win its rightful popularity, is to hasten its use by as many men as possible.

So we offer here, via coupon, a Free Trial Tube. It contains sufficient Shavaid for a convincing test.

After using this Trial Tube, and agreeing that you do not want to be without it, you can then buy Shavaid from your druggist at 50c a tube.

*If your dealer cannot supply Shavaid we will be pleased to fill your order direct.*

B&B

# Shavaid

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***Makers of Sterile Surgical Dressings and Allied Products***

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**Mail free trial tube of Shavaid to**

*Name*.....

*Street Address*.....

*City*..... *State*.....

# ALADDIN

## Book For Homebuilders

efore you build, get a copy of the beautiful book "Aladdin ies" — the most wonderful book ever issued for homebuild- It pictures many homes — the most popular types — bung- s of California designs, attractive dwellings of one and two es, summer cottages, garages, etc., complete with pictures ach, floor plans and descriptions. This book has an impor- message for every homebuilder. Get your copy today.

## voids Waste When Building

he waste of lumber in building is 18%. Homebuilders avoid throwing this 18% away. The book of Aladdin ies shows how it is reduced to less than 2% — a saving ou of not less than $16.00 on every $100.00 of your building ey. Thousands of builders have made substantial savings ling Aladdin Houses — you have the same opportunity.

## addin Houses Will Save You Money

Aladdin Homes are sold direct to you—no dealers' profits. buy direct from manufacturer and your complete house ipped in one car by shortest route. Price includes all er cut to fit, millwork, doors, windows, lath and plaster, ware, locks, nails, paints, varnishes, etc. Send stamps y for copy of the beautiful book "Aladdin Homes" No. 180.

*Send stamps today for catalog 180*

**THE ALADDIN CO.**

968 Aladdin Avenue BAY CITY, MICH.

Canadian Branch: Canadian Aladdin Co., Ltd., C. P. R. Bldg., Toronto, Ontario

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## Close the Query or Exit Access

When you're finished working with a query, you can close it. Closing a query is similar to closing a document in Word or a workbook in Excel. Access gives you the option to save the query design, but you don't have to save it if you don't want to.

1. Click the Close button in the upper-right corner of the query window.



2. If you've made changes to the query design, Access asks if you want to save the changes. Click Yes to save the changes, No to discard the changes, or Cancel to return to the query.



3. To exit Access, click the Close button in the upper-right corner of the Access window.

# Removable *from* its base *for* continuous work

## "YANKEE Vise"

Here's a Vise—"YANKEE" No. 1993—that in flexibility, convenience and capacity—(judged by its power to increase your output and quality of work)—is as different from other Vises as a flash of lightning from a sulphur match.

Now look! Suppose you have a job requiring various operations. First, you've got to "lay it off." Set your "YANKEE" Vise on the surface-plate and go to it! The "YANKEE" begins to help right there because bottom, top, sides and ends are machined exactly true. True with the jaws; true with the surface-plate; true with each other.

**The "YANKEE" lifts off its base, work and all. You can take it in turn, to the drill-press, shaper, milling machine, emery-wheel, planer, perhaps set it in the lathe, vise and all.**

**Ordinarily, you must "true up" for each separate operation. Not so with the "YANKEE." Set your work true only once, and it stays set. No chance to go wrong.**

### "YANKEE" Vise

**No. 1993, with Swivel Base . . . Price, $8.75**
Set screw holds Vise to base; camthrow lever locks position. Body 7¼ x2¾ (wide) x3 in. Hardened steel faced jaws, open 3⅛ in.

**No. 993. Same as No. 1993, but without Swivel Base . . . . . Price, $6.50**

### *Your Dealer Can Supply You*

Ask us to send you free "Yankee Tool Book" showing complete line of ingenious "YANKEE" Tools for modern efficiency work—bench, chain, breast and hand drills, wood-boring and screw-driving tools.

## NORTH BROS. MFG. COMPANY, PHILADELPHIA

# "YANKEE" TOOLS

*Make Better Mechanics*

*Please Mention Popular Mechanics*

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The *new* Goodyear Motorcycle Tire has the Goodyear All-Weather Tread.

This tread is thicker, wider, tougher.

The sharp-edged diamond buttons come farther down on the side of the tire and skidding is lessened.

Because it is thicker and tougher than ever, the *new* Goodyear wears longer.

It is a fit mate of those Goodyear Tires that won the great bulk of all motorcycle races this year.

Ask for the *new* Goodyear—everywhere.

BUILD GOOD ROADS NOW
Work for good roads

Copyright 1919, by The Goodyear Tire & Rubber Co.

GOODYEAR

MADE IN U.S.A.

*Please Mention Popular Mechanics*

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# A Christmas present any real boy is proud to get

CHRISTMAS and a Winchester! What a combination for a real American boy!

Will this Christmas bring *you* a Winchester?

That's up to Dad.

Dad knows you want to shoot and he knows you ought to shoot. He'll get you your Winchester for Christmas if you tell him that's what you want.

*How to get your Winchester*

Ask Dad to take you to the store, and get the dealer to show you the W. J. R. C. Range Kit.

It's the very outfit boys have been waiting years to get — every shooting need provided for — any boy in the country would be proud to have it as a Christmas present.

*Official outfit of the W. J. R. C.*

With the W. J. R. C. Range Kit you, too, can now compete for the famous Winchester trophies — the Marksman, Sharpshooter and Expert Rifleman medals.

Lots of the boys you know have joined the Winchester Junior Rifle Corps and won these rewards of skill with the rifle.

You can do as well. Go to Dad to-day. Tell him you want the W. J. R. C. Range Kit as you have never wanted anything before.

Get Dad to go to the store with you When he takes that shiny Winchester out of the Range Kit and fits it to his shoulder, he'll want it just as much as you do.

Speak to him to-day!

**Winchester Repeating Arms Co.**
**Dept. 1230, New Haven, Conn., U. S. A.**

**WINCHESTER**
***World Standard Guns and Ammunition***

*The new W. J. R. C. Range Kit includes everything you need for shooting — a .22 caliber Winchester rifle, a canvas gun case, ammunition, cartridge belt, cleaning rod, and three gun cleaning preparations — all packed in a handsome, durable case. The outfit also contains a supply of official targets and a copy of the W. J. R. C. rule book.*

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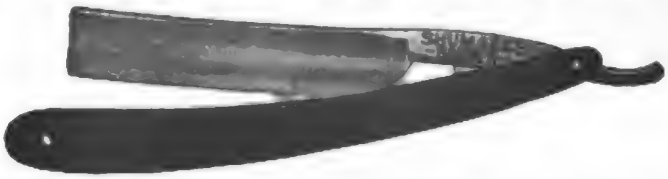
# SHUMATE RAZOR

## Written Guarantee with Each Razor



SHUMATE RAZORS are so good that we guarantee them for life. Here's the reason: The blade is made from tungsten alloy steel, which takes a keener edge than any other steel can—and holds it. You can use a SHUMATE for years without honing. The secret of this wonderful steel is ours alone, and we guard it jealously.

### THE SHUMATE GUARANTEE:

Buy a SHUMATE RAZOR and use it, not only a few times, but as long as you like. If you decide after an exacting trial, that you don't like it, we'll exchange it for a new one without a word.

SHUMATE RAZORS represent the skill and knowledge acquired during thirty five years devoted exclusively to the production of razors. Two generations have used them.

$2. To settle the razor question for life, send us $2.00 and the SHUMATE Barber razor will be sent to you postpaid. For those with very strong wiry beards, we recommend our $3.00 SHUMATE RAZOR, specially ground for this purpose. In remitting, give us your dealer's name, and a chamois lined, rust-proof case will be included with your razor.

SHUMATE RAZOR COMPANY, 802 CHESTNUT ST. ST. LOUIS, U. S. A.

Established 1884 Capacity 10,000 Razors Daily

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# To All Men

## Whose Teeth Do Not Stay White

*All Statements Approved by High Dental Authorities*

### The Reason is a Film

Millions of men find that teeth brushed daily still discolor and decay. Tartar forms on them—tobacco stains appear. And with thousands pyorrhea gets a start.

That is evidence that teeth are not kept clean. Your methods are inadequate. You leave a film—that slimy film. It clings to teeth, enters crevices and stays. The tooth brush does not remove it all. The ordinary tooth paste does not dissolve it. So, night and day, it may do a ceaseless damage.

### It Wrecks the Teeth

The film is what discolors—not the teeth. It is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea. Thus most tooth troubles are now traced to film.

---

Dental science, after years of searching, has found a film combatant. Dental authorities have proved its efficiency. Now it is embodied in a dentifrice, called Pepsodent, so everyone may use it every day. We urge you to ask for a free 10-Day Tube and see what it means to you.

### A Pepsin Paste

Pepsodent is based on pepsin, the digestant of albumin. The film is albuminous matter. The object of Pepsodent is to dissolve it, then to constantly combat it.

Pepsin long seemed impossible. It must be activated, and the usual agent is an acid harmful to the teeth. But science has found a harmless activating method. Countless tests have proved this. And that method has made active pepsin possible.

You can see its effects. And, when you know the reason, can judge them for yourself.

Send the coupon for a 10-Day Tube.

### Look in 10 Days

Let your own teeth decide the right method of cleaning.

Note how clean the teeth feel after using. Mark the absence of the slimy film. See how the teeth whiten as the fixed film disappears.

The question is all-important. White, clean, safe teeth are impossible with film. Cut out this coupon—learn the way to end it.

271

**Pepsodent** PAT. OFF. REG. U. S.

*The New-Day Dentifrice*

**After five years of tests under able authorities, it is now advised by leading dentists and sold by druggists everywhere.**

### Ten-Day Tube Free

THE PEPSODENT COMPANY,
Dept. 845, 1104 S. Wabash Ave., Chicago, Ill.

Mail 10-Day Tube of Pepsodent to

Name.....

Address.....

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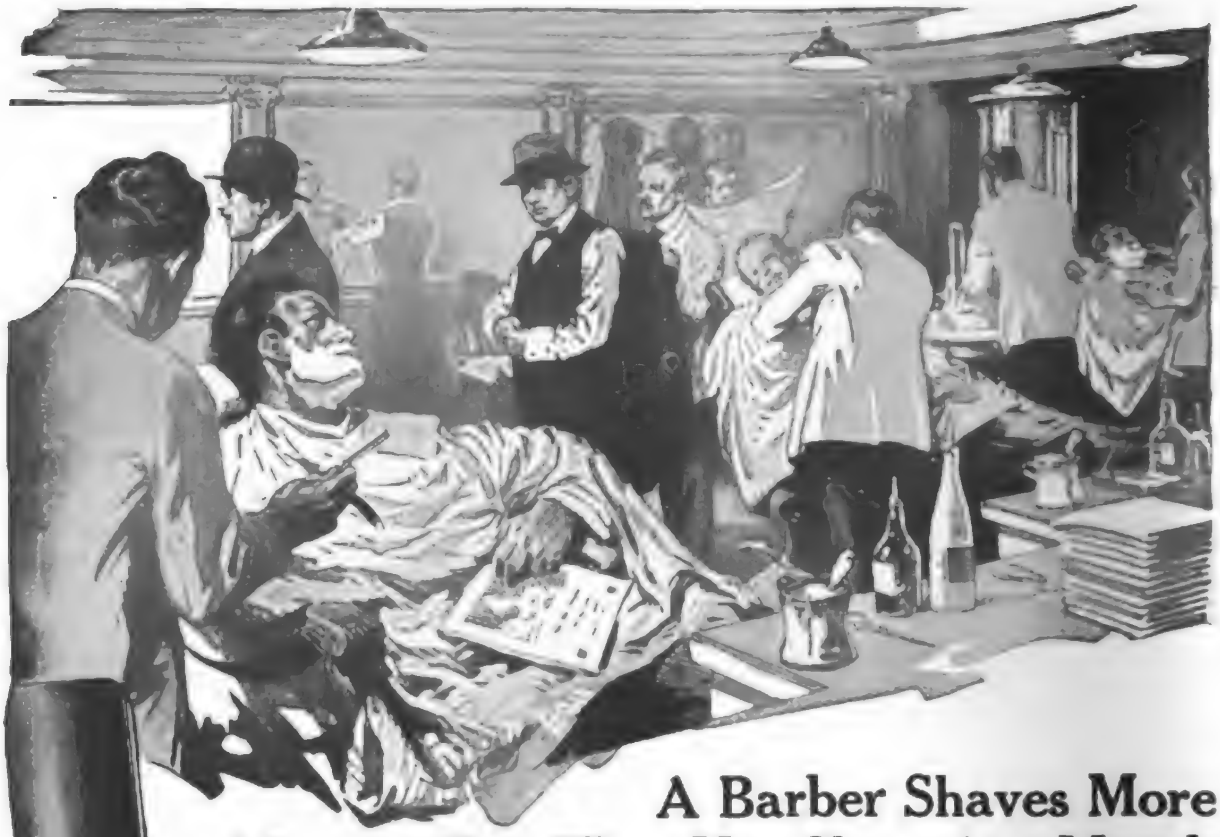


# A Barber Shaves More Men in a Day Than You Shave in a Month

HAVE you noticed that all barbers use just one type of razor—the Genco type? Some men deny themselves a regular razor because they imagine that stropping a regular razor is an Art or the trick of a skilled hand. 200,000 barbers don't. They simply buy razors built to strop.

***Anybody Can Strop a GENCO Razor***

It's built to strop. It has a broad back; its blade is hollow ground; and right behind that thin, keen edge is a slight bevel. Back, hollow-grinding and bevel, all three help to set its edge against the strop at exactly the correct angle. A few light strokes, and you have the smoothly cutting edge all barbers recognize the need of having.

Save the time and money that every barber does. A barber shaves hundreds to your one, but—you shave over 300 times a year.

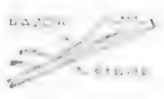
Drop in on your dealer. Look for the three features mentioned. Every GENCO Razor is hand-forged and hand-ground from special steel. That's necessary because of our guarantee—"GENCO Razors must make good or we will."

*If your dealer hasn't GENCO Razors, we will supply you*

**Geneva Cutlery Corporation**
**49 Gates Ave., Geneva, N.Y.**
*Largest Exclusive Manufacturers of High-Grade Razors in the World*

**Genco RAZORS**

Reg. U.S. Pat. Off.



Note how Genco Razors meet the strop at just the proper way to assure a perfect cutting edge. The bevel leads back into the edge and guides it on the strop.

***Please Mention Popular Mechanics***

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## Extraordinary Coat Values!

# CHASE

# FURWOVE

# BLACK BEAR COATS

DON'T think because fur coats are costly that you will have to go without a good, warm, rich-looking coat this winter. These wonderful coats—***Furwove Black Bear,***—have the merits of fur—carefully manufactured material made at our own mills, and then skillfully tailored under our own supervision in our own factories. Note that we have been leaders in manufacturing since 1847.

Don't hesitate to grasp this opportunity. These coats represent far more value than any words can tell. You can readily compare a ***Furwove Black Bear*** coat with any wool or fur coat. It will meet every test and will make you wonder how we can sell them at only **$35.00.**

### FEATURES

***Inexpensive:*** No luxury tax; $35.00 is low for any kind of a coat to-day.

***Durable:*** A specially woven foundation holds fibres in place—no splitting apart like the pelts of fur—wove in one piece.

***Sanitary:*** No odor arises after exposure. Different from fur in this respect.

***Warm:*** ***Black Bear*** coats are made so that they afford protection like the coat of fur given Arctic animals by Nature—wind doesn't penetrate.

***Rich Appearing:*** Beautiful, soft surface, and full lining all carefully tailored, carry a wealth of appearance.

***Reputation:*** Backed by our national reputation—known since 1847.

The severest of weather can be faced in a ***Furwove Black Bear*** coat—turn up the deep collar, and you are protected from shoes to hat—a big coat that protects both your body and pocket-book.

Remember the big features—exceptionally low priced, only **$35.00.** Different sizes from 36 up.

Beautifully tailored, rich-looking garments with our label of protection sewn in every one. Don't accept substitutes!!

**L. C. CHASE & CO., BOSTON**

**NEW YORK DETROIT CHICAGO SAN FRANCISCO**

***Leaders in Manufacturing since 1847***

L. C. CHASE & CO., 89 Franklin St., Boston

Please send me Black Bear Coat. Size.....

I understand I can change size if necessary.

Name.....

Address.....

(Postl Money Order for $35.00 Enclosed)

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Oakland

OAKLAND OWNERS REPORT RETURNS OF FROM 18 TO 25 MILES PER GALLON OF GASOLINE AND FROM 8,000 TO 12,000 MILES ON TIRES

THIS NEW OAKLAND SENSIBLE SIX FOUR DOOR SEDAN IS POWERED WITH THE FAMOUS 44-HORSEPOWER, OVERHEAD-VALVE OAKLAND [illegible]

# OAKLAND
## SENSIBLE SIX

AN appreciable proportion of the Oakland Sensible Six four door Sedans now being sold are going to families to whom first-cost is not the paramount consideration in the purchase of an automobile. These people are buying Oaklands purely on the basis of what Oaklands can give them in service, and of what Oaklands represent in value as against the moderate investment they entail. They find in the new Oakland Sensible Six four door Sedan a degree of constant usefulness that no other type of car can equal, and a measure of chassis reliability that even the most strenuous service cannot defeat. Every essential convenience, from mechanical lifts for the windows in its double-latch doors to an inconspicuous heater for use on cold days, has place in the equipment of this commodious and attractive car.

TOURING CAR, $1075; ROADSTER, $1075; COUPE, $1295; FOUR DOOR SEDAN, $1295
F. O. B. PONTIAC, MICH. ADDITIONAL FOR WIRE WHEEL EQUIPMENT, $55

OAKLAND MOTOR CAR COMPANY
*Pontiac, Michigan*



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# Silent Servants of Humanity

## *Tycos Thermometers*

ADVERTISING
ARMORED
ART NOVELTY
ASPHALT TESTING
AUTO-CIRCULATION
BABIES' FOOD
BAKERS
BAKE OVEN
BANK
BATH
BOTTLE TESTING
BRINE PIPE
BROODER
BUTTER
CANDY MAKING
CELLULOID
CHANDELIER
CHEMICAL
CHURN
COAL OIL
COLD STORAGE
COLD TEST
COPPER CASED
DAIRY
DENTAL
DESK
DEVELOPING BATH
DIAL
DOUGH TESTING
DRY KILN
ELECTRIC
ELECTRIC ALARM
ENGRAVED SYSTEM
FAT TESTING
FEVER
FROST ALARM
FRUIT CAR
FRUIT EVAPORATING
GAS WORKS
GLASS WINDOW
GREENHOUSE
HOME CANDY MAKING
HOT BED
HOT WATER HEATING
HOUSEHOLD
HYDROMETER CAN
LABORATORY
LITHOGRAPHED TIN SCALE
MAPLE SUGAR
MARINE
MAXIMUM AND MINIMUM

FROM the kitchen range to the steel rolling mill—in every industry, in practically every phase and activity of life, temperature and temperature control is a mighty factor.

Everything you eat, wear or use is effected by temperature. Without temperature indicating, recording and controlling devices there could be no food preserving industry, no refrigeration, no steel industry, no rubber manufacture—none of a myriad industries. And physicians and surgeons would be at loss for accurate aids in safeguarding human life.

There are over 8,000 different kinds of temperature and pressure indicating, recording and controlling instruments in the Tycos line—over 8,000 silent servants of humanity. And in practically every industry and in every land Tycos instruments are known and used because of their dependable accuracy.

In the panels we list a few Tycos instruments. Ask your dealer about any instrument or type of instruments in which you are interested. If he won't supply you write direct to us for information and prices.

MEAT PACKERS'
MILK PASTEURIZING
MILK STERILIZING
ORCHARD
OVEN
PACKING HOUSE
PASTEURIZER
PHOTOGRAPHERS
PIPE
PLATE GLASS
POCKET
PORCELAIN
PRECISION
RADIAL SCALE
RAILWAY
RECORDING
REFRIGERATION
REGISTERING
SEA WATER
SHIP HOLD
SHOWER BATH
SICK ROOM
STERILIZING
SUGAR FACTORY
SUGAR HOUSE
TITER TEST
TOBACCO CURING
TONING BATH
TRACK LAYING
VETERINARY
VULCANIZING
WEATHER BUREAU
WINDOW

## *Other Tycos Instruments*

AVIATION ANEROIDS
BAROMETERS
CALCIOMETERS
CHARGOMETERS
CLINOMETERS
COMPASSES
CREAM GAUGES
FREEZOMETERS
HYDROMETERS
HYGROMETERS
HYGRO AUTOMETERS
PSYCHROMETERS
RAIL GAUGES
RECORDING BARO-THERMOGRAPH
SACCHAROMETERS
SALINOMETERS
SPHYGMOMANOMETERS
SPRAYOMETERS
STORMOGRAPHS
THERMOGRAPHS
TRANSITS

# *Taylor Instrument Companies*

ROCHESTER, N.Y.

There's a *Tycos* and *Taylor* Thermometer for every purpose

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# REMINDO

## *You'll switch off the light—* REMINDO *won't let you forget*

THE moment you turn on the cellar light or the garret light—any light with which Remindo is connected—you hear a gentle, pleasant buzz right at the switch.

And Remindo keeps buzzing gently till the light is switched off again.

Remindo reduces light bills—for it saves current often wasted for hours at a time—when you forget to switch off a light.

Remindo costs very little. The current it saves pays for it quickly.

Your electrical dealer will gladly show you Remindo. It's in the blue-and-orange convenience carton that identifies all the new G-E Electric Conveniences.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

G-E electric conveniences

GENERAL ELECTRIC COMPANY

*Please Mention Popular Mechanics*

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Construction Sets Wagon

Here's a set that will delight any boy. Not only can he build a wagon, but he can build a dozen other things as well. Contains 150 pieces, including wheels, axles, bolts, nuts, screws, etc. Also a screwdriver and wrench. Instructions for building wagon and other things. Size of box, 12 x 8 x 2 inches. Weight, 3 pounds.

No. 1 Set, Price, $1.00

Mail Orders Filled Promptly

GILBERT TOYS

"Made in America" American Flyer
"The Train with the Guarantee" MINIATURE RAILROADS
Registered U.S. Patent Office

# The Electric Train That Is More Than a Toy

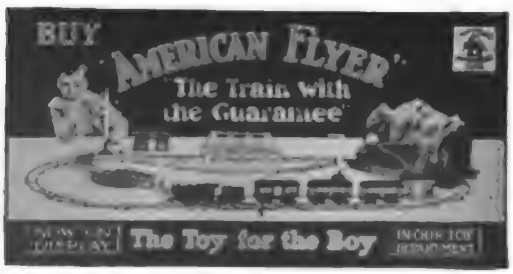
The "American Flyer" Electric Train is a practical introduction to the great field of electricity. It gives actual experience with electrical apparatus. It is more than fun—it is educational and intensely interesting.

Exclusive features distinguish these electric trains. Thanks to perfect construction and adjustment, motor efficiency gives maximum power on minimum current. Low current means less strain, no heating, longer life for motor. Longer life for batteries, too, if batteries are used. Cars and engines are just like real. Ask for an "American Flyer" Electric outfit for Christmas.

### Transformers

"American Flyer" Electric Trains will run on batteries, but "American Flyer" Transformers are more economical and give better results. With a Transformer you can use the house current. "American Flyer" Transformers are especially built for "American Flyer" Trains. Longer life and greater satisfaction are secured by using the Transformer that is made for these trains. Price $4.50.

# "American Flyer" Mechanical Trains




### Look for this Sign

Look for this Sign. It marks an "American Flyer" dealer. Wherever you see the boy operating the "American Flyer" train you may know you can get the best railroad outfit made, in that store.

Engines and cars are just like the latest type trains. Lever control and brakes on engines—just like real—are exclusive "American Flyer" features. The "American Flyer" Patented Steel Gear Motor makes these engines go faster with heavy loads.

### Send for Interesting Catalog

Complete railroad outfits are shown in this fascinating book. Everything the railroad man uses. Join the 2,000,000 happy boys who already own "American Flyers."

### Ask Your Dealer

to show you an "American Flyer" System. If he can't, write us direct. Set your heart on an "American Flyer" this Christmas and be sure you get it.

**AMERICAN FLYER MFG. CO.**
**2235 S. Halsted St. CHICAGO, ILL.**
***Makers of a complete line of Electrical and Mechanical trains***

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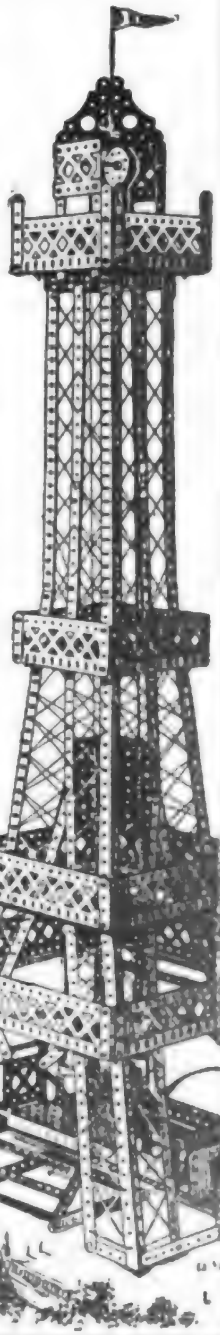
# MECCANO

**Toy Engineering For Boys**

XMAS, with its gift-giving fun, is nearly here. Have you and Dad decided on your Meccano outfit? You should. For all-around fun, every day in the year, nothing takes the place of Meccano building with live, wide-awake boys. That's because you can build wonderful, real engineering structures like this great tower, the Beam Engine and the Electric Locomotive; also hundreds of others that *work*, like regular machinery.

**YOU Can Build This Eiffel Tower**



Each outfit complete. No study necessary. Big, illustrated manual furnished makes it all clear and easy. Your fun begins at once.

425 Dandy Models! With all Meccano outfits from No. 1 upwards you get illustrated instructions for building 325 models. Then comes Book No. 2 with 100 prize models, and something new is being added all the time!

**Send for This BIG $4.50**

## Xmas Set

***Postpaid if not at your dealer's***

**With It You Can Build:**

Railroad Cars
Sleighs
Swings
Windmills
Cable Railways
Jib Cranes
Monoplanes
Bridges
Drilling Machines
Potter's Wheels
Torpedo Boats
Merry-go-rounds
Ore Crushers
Lathes
Beam Scales
Machine Guns
Drill Presses
and scores of others

## SUPERB FREE BOOK

Complete story of Meccano, told by the inventor himself in a book called "The Wonder Book." Contains many pictures of models and boys building them—also hours of interesting reading. This absorbing book will be sent you free. Let us have your name and address now, so you will receive it before Xmas.

**Prices of Meccano Outfits**

| | | | |
|---|---|---|---|
| No. 00, | $1.00 | No. 2, | $6.00 |
| No. 0, | 1.50 | No. 2X, | 7.50 |
| No. 1, | 3.00 | No. 3, | 9.00 |
| No. 1X, | 4.50 | No. 3X, | 12.00 |

And up to $40.00

**Motors**

Electric, Reversing, $4.00
Electric, Non-Reversing . . . 2.00
Clockwork Motor . 3.00

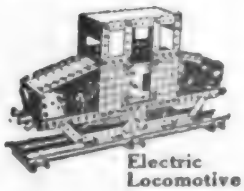
*Outfits and motors sent prepaid on receipt of price if not at your dealer's.*

**MECCANO CO., Inc.**

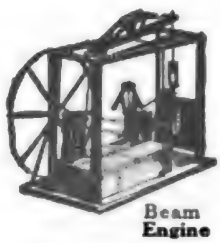
Division H

71 West 23d Street,

NEW YORK, N. Y.



Electric Locomotive



Beam Engine

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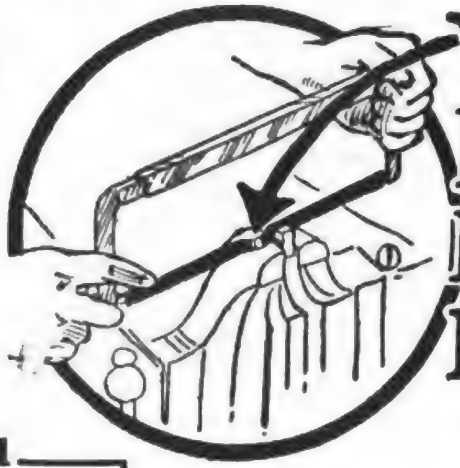
# ATKINS

## AAA NON-BREAKABLE HACK SAW BLADES



## Why This Hack Saw Blade Does Not Break!

## One of These Books Is of Value To You

These books describing Atkins Products are full of useful suggestions of value to every man. At least one of them has a big, valuable story for you. We will send you any of them without charge. Just check the one you want and write your name and address on the margin of this page. Mail it today!

*"Atkins Metal Saws"*
*"Metal Cutting Machines"*
*"Hack Saw Blades"*
*"Atkins Hack Saw Chart"*
*"Atkins Cross Cut Saws"*
*"Silver Steel Drag Saws"*
*"Atkins Mill Saws"*
*"Atkins Braces"*
*"Atkins Machine Knives"*
*"Atkins Plastering Trowels"*
*"The Story of Silver Steel"*
*"Saw Sense"*
*"The Saw on the Farm"*
*"The Manual Training Book"*
*"Saws in the Filing Room"*

IF you ever cut metal with a hack saw—it will pay you to know about Atkins AAA Non-Breakable Hack Saw Blades.

They make metal cutting faster and easier—do away with lost time and material and broken blades.

Like "Silver Steel" and many other great improvements in saw making—the Non-Breakable Hack Saw Blade is an Atkins discovery.

The body of the blade is of tough, selected steel. You can turn and twist it without breakage in work. The cutting edge is gas-and-oil tempered to give quick, easy cutting.

The Atkins Hack Saw Chart (sent free) tells the right blade for every metal cutting use and lists the full line of Atkins AAA, Non-Breakable and Power Hack Saw Blades.

## Try This Blade—Now!

If you send us your name and address and 10c in stamps we will send you an 8 or 10 inch Atkins AAA Non-Breakable Hack Saw Blade. Try it on your regular work. We'll return your money, if it isn't the best blade you ever used. Write for your saw today!

## E. C. Atkins & Co., Inc., (Est. 1857) Indianapolis, U. S. A.

***Makers of Silver Steel Saws and Tools; Automobile Clutch Discs; Meat Slicer, Belt Splitting, Cigarette and Tobacco Knives; Cabinet Scrapers and Specialties.***

**Canadian Factory: Hamilton, Ont.; Machine Knife Factory: Lancaster, N. Y. Branches in New York, Chicago, Memphis, New Orleans, Atlanta, Minneapolis, Seattle, San Francisco, Portland, Ore., Vancouver, B. C., Paris, and Sydney, N. S. W.**

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Wurlitzer Cornet Outfit

*Reg. U.S.* *Pat. Off.*

# WURLITZER

200 YEARS OF MUSICAL INSTRUMENT MAKING

## Complete Musical Outfits Sent on Trial

A NEW plan. Wurlitzer, the largest general music house in the world, is offering the finest musical instruments with complete outfits at factory price. With each instrument comes a handsome carrying case; all attachments and extra parts; music rack; instruction book and book of musical selections. Everything you need at a tremendous saving. Total cost practically that of the instrument alone.

Wurlitzer Saxophone Outfit

## Convenient Monthly Payments

Any Wurlitzer Complete Musical Outfit will be sent you for a full week's free trial in your own home. You are under no obligations to buy. If you decide to keep it you may pay the direct-from-manufacturer price in small monthly sums. A few cents a day will make one of these beautiful instruments and outfits your own.

These Complete Outfits are ready. Send for one on free trial.

| | | | | |
|---|---|---|---|---|
| Violin | Trap Drum | Bugle | Tenor Banjo | Banjo-Guitar |
| Cornet | Clarionet | Fife | Banjo-Mandolin | Ukelele |
| Saxophone | Piccolo | Guitar | Banjo-Ukelele | Hawaiian Guitar |
| Trombone | Flute | Mandolin | Banjo | Viola |
| Mellophone | | | | Cello |

W er Violin Outfit

## Send the Coupon *For Splendid New Catalog*

The instrument of your choice and everything in the complete outfit fully illustrated and described, with full details of the free trial and easy payment plan. We are manufacturers of all musical instruments. This wonderful catalog is a veritable musical encyclopedia. We will send it to you free and without obligation. Mention the musical instrument in which you are interested. Mail the coupon now.

**The Rudolph Wurlitzer Co., Dept. 1199**
**117 E. 4th St., Cincinnati—329 S. Wabash Ave., Chicago**

Send me your new catalog with illustrations in color and full description of the Wurlitzer Complete Outfits and details of the free trial and easy payment offer.

Name.....

Address .....

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*(Musical instrument I am especially interested in)*

*Please Mention Popular Mechanics*

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# WALTHAM THE SCIENTIFICALLY BUILT WATCH

# AND THE FOREIGN BUILT WATCH

*The Master Assembler*

## Know Something About the "Works" in the Watch You Buy

THERE are limitations to human handiwork in watchmaking which American genius has circumvented by the miracles of machinery — miracles which, for exactitude, precision and finish — transcend the skill of the human hand.

We have told you that Waltham machinery creates a standard of accuracy unapproached elsewhere in the world. That the "parts" of Waltham movements are distinctive in material, design and advanced process of manufacture. And when these "parts" come to the Waltham Master Assembler, they meet the eye, the skill, the knowledge of a master craftsman thoroughly conversant with the formulas exclusively invented and developed by Waltham genius in watchmaking.

He is the assembler of the Balance and Hairspring (the heart and brain of the watch) which ultimately beats upon your wrist or in your pocket 432,000 pulsations a day, year in and year out. A transferring of energy into motion that is truly wonderful when we seriously think of it.

The Assembler of the foreign-built watch, known as a "repasseur," is to be pitied. He knows no defined standard of quality. The material that comes for his inspection is of unknown quantity in accuracy of construction and finish. His capacity is rather that of a judge. He must decide on the barest information and appearance whether one part is good enough to equal or stabilize another. This condition exists because the foreign-built watch is an assembled watch — the parts made in many shops and homes, with *hand* machines; no standardization, no ideal, and every buyer of a foreign-built watch incurs this liability.

The Waltham Master Assembler is unique. He is a product of Waltham supremacy in watchmaking. He is the human distinction hidden in this world-famed watch — a unit in its performance which has placed it in actual competition above the world's finest watches. He is a living symbol of Waltham, guarding day by day an international reputation, at once a guarantee to you that your purchase of a Waltham Watch is a lifelong investment.

*This story is continued in a beautiful booklet in which you will find a liberal watch education. Sent free upon request. Waltham Watch Company, Waltham, Mass.*

**Waltham 7½ Ligne**

The movement is actually smaller than a dime in diameter

$175 to $1,000 or more

depending upon the case

# WALTHAM

## THE WORLD'S WATCH OVER TIME

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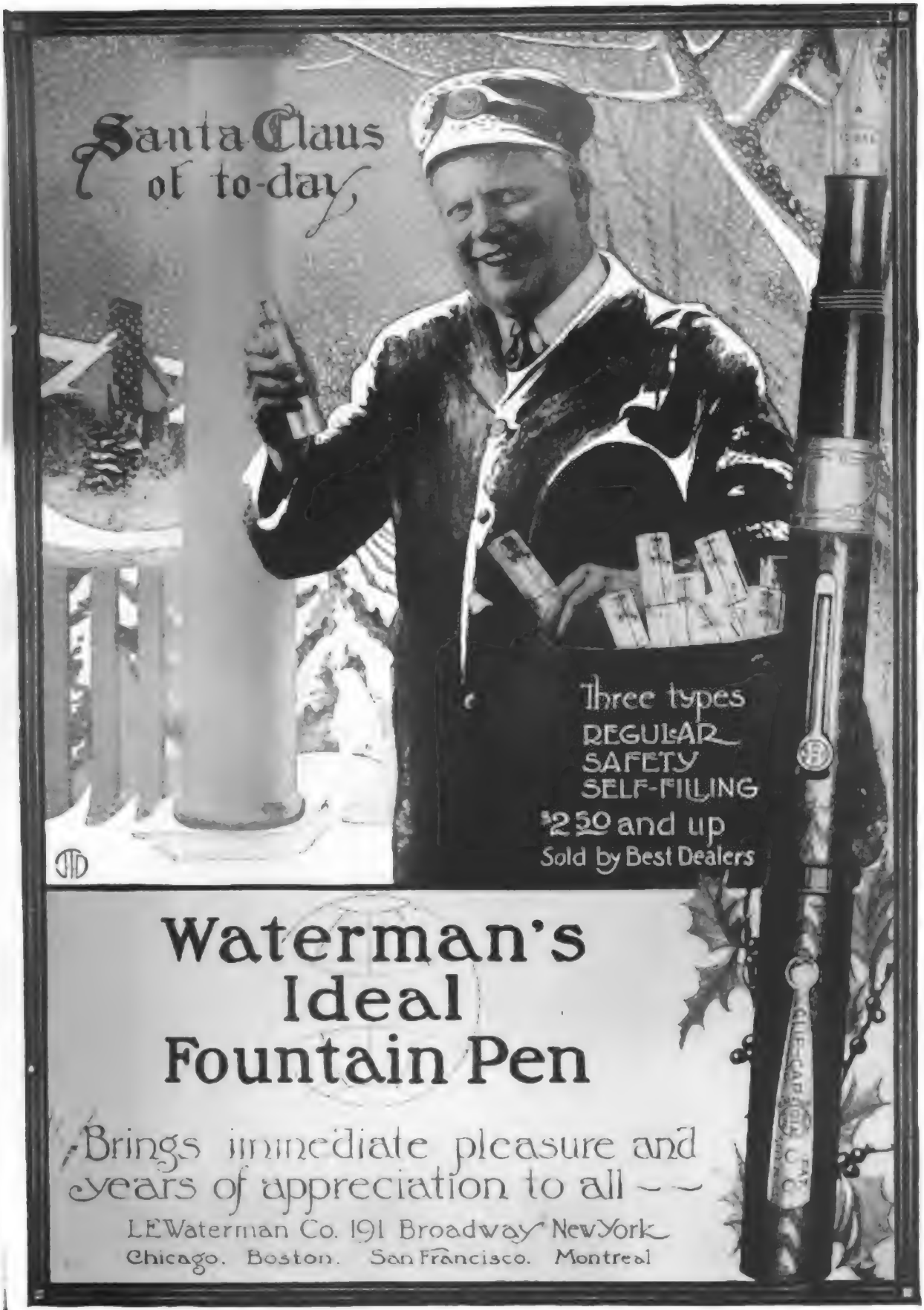


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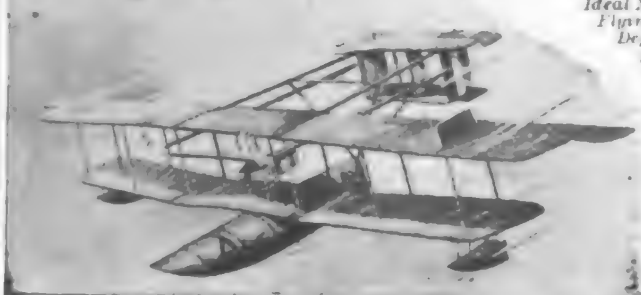
## Get an
# Ideal Model Aeroplane
## for Christmas!

Building and Flying Ideal Model Aeroplanes is the finest fun you ever had because Ideal Models are perfect duplicates of well-known aeroplanes. They look exactly like real aeroplanes, and have parts and fittings just like actual machines. Build one and learn how aeroplanes are constructed, operated and controlled. You'll have fun building it and then you can make flights; Ideal Model Aeroplanes are guaranteed to rise from the ground or water by their own power and fly in the air.

### *Plans for Model Aeroplanes*

Scale Drawings, with full Building and Flying Instructions for the following Ideal Model Aeroplanes, sent upon receipt of price:

**NC-4** (Naval-Curtiss Seaplane)...50c
**DeHAVILLAND Battle Plane, 35c**
**Blériot Monoplane, Curtiss Military Tractor, Nieuport Monoplane, Taube Monoplane, Cecil Peoli Racer—35c Each.**



## Build and Fly Models of Real Aeroplanes

Ideal Model Aeroplane Construction Outfits make building easy. They contain all parts, fittings and materials, with Plans and full Building and Flying Instructions—you can't go wrong. You make the parts and assemble them just like a real Aeroplane mechanic. You can get Outfits to build any of these famous Aeroplanes from Ideal Dealers in your city or state, or direct from us where we have no dealer:

**N C - 4** (Naval-Curtiss Seaplane). First to cross the Atlantic Ocean. 4½ ft. Model. See picture No. 1. Complete Construction Outfit.....**$10.00**

**DeHAVILLAND Battle Plane** (DeH-4). The 'plane used by the American Aces in France. 3 ft. Model. Pictured above. Complete Construction Outfit.....**$8.50**

**Blériot Monoplane.** The Famous Cross-Channel Model. 3 ft. size. See picture No. 2. Complete Construction Outfit. Price.....**$6.00**

**Curtiss Military Tractor.** The 'plane used for training pilots. 3 ft. Model. See picture No. 3. Complete Construction Outfit.....**$7.50**

**Nieuport Monoplane.** The French Scout 'Plane. 3 ft. Model. See picture No. 4. Complete Construction Outfit.....**$7.00**

**Cecil Peoli Racer.** A Racing-type, record making flyer. Complete Construction Outfit. Price.....**$4.50**

*West of Denver, Colo., Prices are a Little Higher.*

## Ideal Racing Aeroplanes and Flying Toys Are Great Fun

Ideal Racing Aeroplanes (Not Models of Real Aeroplanes) are record breakers; they fly far and fast; with, against or across the wind. Ideal Flying Toys, too, are fine fun-makers for all boys. Different styles to pick from, all well made and reasonably priced. Some sold in knock-down form ready to put together; others complete ready to fly.

*Ideal Model Aeroplanes, Ideal Racing Aeroplanes and Ideal Flying Toys are sold by Leading Toy, Sporting Goods and Department Stores. Ask for them at your store. Be SURE you get IDEAL Model Aeroplanes because they are the best and the only ones that are actual copies of the real, famous aeroplanes.*

### *Ideal Aeroplane Catalogue—10c*

Send for this Catalogue of Model Aeroplanes, Parts and Supplies and find out more about these wonderful Models of real aeroplanes. Catalogue sent postpaid for 10 cents, stamps or coin. Gives list of all Ideal Dealers.

**Ideal Aeroplane & Supply Co.**
*Making Model Aeroplanes Since 1911*
**159 Wooster Street NEW YORK**
*Cor. West Houston Street*

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# Transportation—*The New Sport for Real Boys*

If you only had a railroad of your own, or a fleet of power boats, what sport you would have! Just think of the fun being president, superintendent, dispatcher, engineer and conductor on your own train or captain, mate, purser, helmsman, and engineer of your own boats.

Ives Toys make this all possible. There are fine, big Ives Trains that run by electricity. Start the powerful electric locomotive by a switch; control its speed. Stop the train and reverse it at your will. With Ives stations, switches, sidings, semaphores, culverts, tunnels, bridges and other parts you can have a complete railroad system, as elaborate as you wish. Then there are Ives Trains that are pulled by mechanical locomotives with strong motors that run a long time on one winding. Ives builds passenger and freight cars, baggage cars, coal cars—all kinds of rolling stock. And they are built to last, just like regular cars.

## Ives Toys

**Make Happy Boys**

Ives Boats are the newest and finest toys out. Made of steel and driven by screw propeller and strong, long-running motor. Steered by a regular rudder, Ives Boats speed along at a great rate for long distances on a single winding. There are twelve models and sizes, among them being an ocean liner, U. S. Merchant Marine, patrol boat, launch, motor boat, freighter and others.

Good toy stores and toy departments everywhere sell genuine Ives Toys. Be sure that the name "Ives" is on the train or boat you buy. For 4c in stamps we will send you either our booklet on boats or our folder on trains; both for 6c. The boat book contains rules of the sea, signals, dictionary of nautical terms and other navigation information.

THE IVES MFG. CORPORATION

202 Holland Avenue

Bridgeport, Conn.

SAVE THIS COUPON FOR BOOKS

THE IVES MFG. CORPORATION, 202 Holland Ave., Bridgeport, Conn.

Enclosed find ____ cts. (stamps) for which please send me your ( ) Train Folder ( ) Boat Book.

Name .....

Address .....

City ..... State .....

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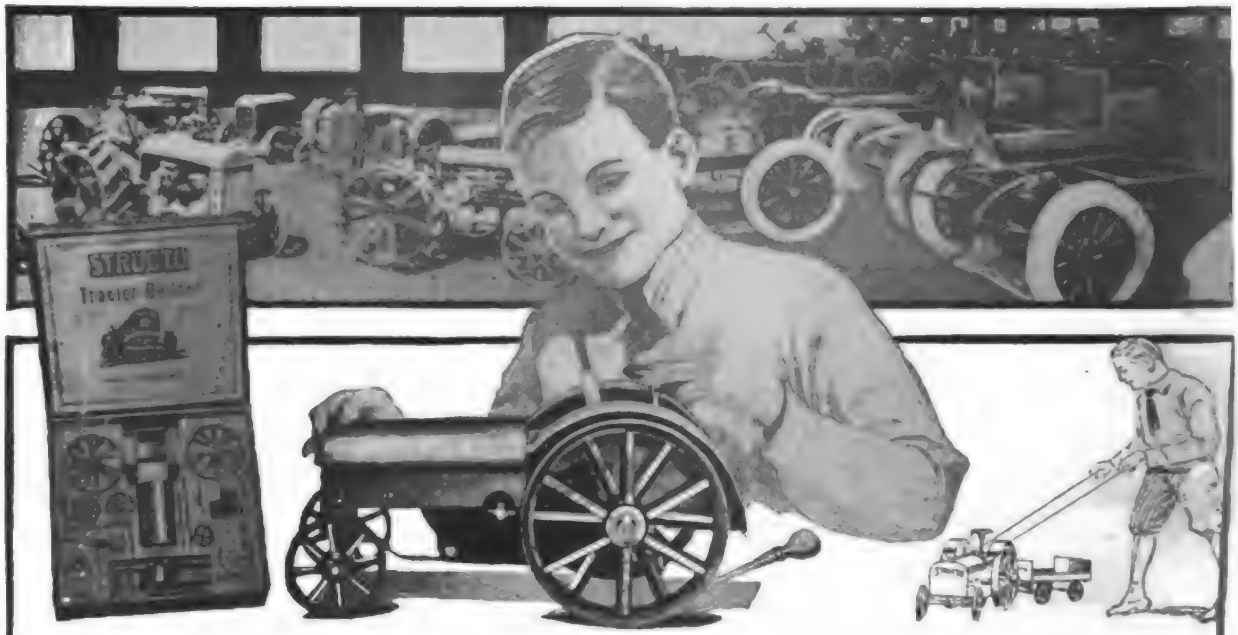



# Build Models Like Real Automobiles!

Structo Tractors, Trucks and Automobiles are built like real machines. They *are* real machines—made for boys to build—have parts like real cars. You build your own Automobile, Tractor or Truck—learn the principles of automobile construction, and have a lot of real sport while you're doing it.

Structo Models have lots of speed and pulling power. Strong, powerful motors send them over the road in record time; straight ahead or around in a circle, up-grade or on the level. They have many features of real cars.

# STRUCTO TOYS

MAKE MEN OF BOYS

Look at these dandy Models; all the newest type machines that are copies of big ones. Pick the one you want now and head your Christmas list with a Structo Auto Builder Outfit. Tell all the folks to be *sure* and get you one.

## Structo Bear Cat Auto

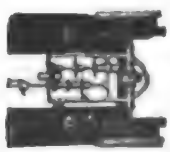
**Model No. 10**

16 in. long. Red body. Single-unit motor; shaft drive. Price..... **$6.50**

## Structo Racing Auto

**Model No. 8**

Green body. Single-unit motor; shaft drive. Price..... **$5.00**



## Made Like a Real Automobile

See the sliding gears and the regular differential. Throw in the gears and she's off! High or low speed and reverse.

Model in picture above is Structo Farm Tractor; Model No. 11. Price..... **$7.50**

*West of Denver, Colo., and in Canada, Prices are a little higher.*

## Structo De Luxe Auto

**Model No. 12**

16 in. long. Orange body. Triple-unit motor; sliding gear transmission and differential. **$10.00**

## Structo Dump Truck

**Model No. 14**

Red body. Triple-unit motor; sliding gear transmission. Load dumping attachment. Price **$12.00**

Ask to see Structo Auto Builder Outfits in the Toy Department, at the Hardware Store, or at any store that sells good toys. Ask for them by name. Get one and you'll have loads of fine fun.

**STRUCTO MANUFACTURING CO., Freeport, Ill., U. S. A.**

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# Buy American-Made Toys

SANTA CLAUS—the good American that he is, this year has turned to Uncle Sam for his toys. In fact the pair of them have been working together for months and months for our American kiddies.

They have planned and arranged and built really wonderful things. They are original—there is a host of new toy ideas.

They are conceived and built by American men and women — they are not the thoughts or work of foreign countries.

American-made toys are best for the children because each toy is perfect. The design is right, the craftsmanship is careful—there are more to pick and choose from. They are educational—they are amusing.

This Christmas make children happier with American-made toys.

This season — this coming New Year — resolve to support American industries — to protect American trade. Patronize the toy store that shows the circle of Uncle Sam and the laughing, happy children. You will find there the greatest assortment of Christmas and all-year-round toys — the best ones too.

*Patronize the toy store that displays this sign*

*This space is contributed to the cause of American industries by the Toy Manufacturers of the U. S. A., Flatiron Bldg., New York*

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## The Trade-Mark that Reflects the Truth

The Iver-Johnson is known the world over as the revolver that can't go off by accident. Drop it, throw it, or "Hammer the Hammer"—it is the *safe* revolver.

# IVER JOHNSON SAFETY—AUTOMATIC REVOLVERS

The Iver Johnson is alive, alert, ready. Drawn tempered piano-wire springs assure permanent readiness for use. And the perfect rifled barrel speeds the bullet straight as a streak of light just where you aim.

Choice of three grips: Regular, Perfect Rubber, Western Walnut.

*Three Booklets Free*

All worth reading. "A"—Firearms. "B"—Bicycles. "C"—Motorcycles. Yours free merely for the asking.

If your dealer cannot supply the Iver Johnson, send us his name and address. We will supply you through him.

IVER JOHNSON'S ARMS & CYCLE WORKS
307 River Street, Fitchburg, Mass.
99 Chambers St., New York 717 Market St., San Francisco




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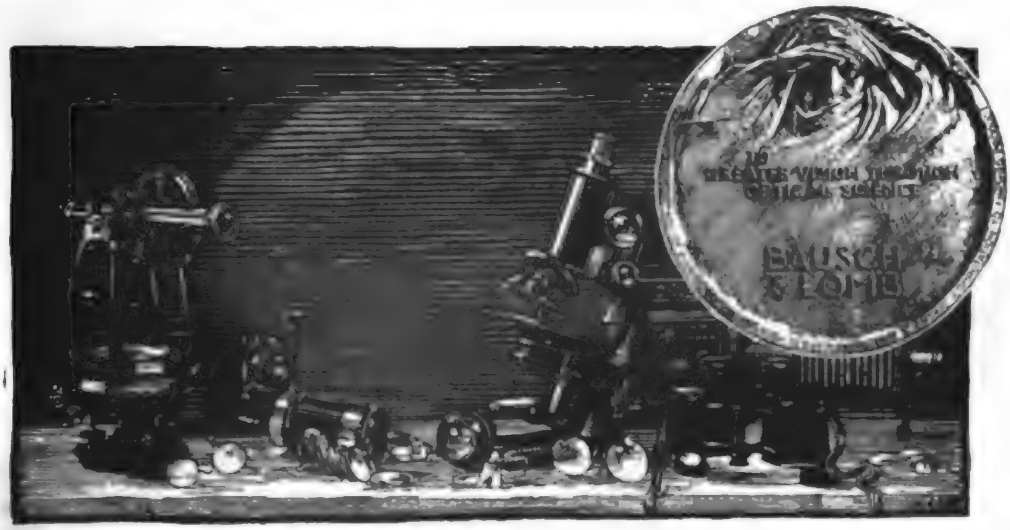


**A piece of glass . . . just a bit of sand and of salt . . . exactly combined, carefully melted, skilfully formed and polished — a LENS!**

—and windows open upon other worlds, too tiny or too far away for naked eyes to see. Marvelous instruments come to the aid of industry, or play their vital part in war, on land or sea or in the air; old eyes grow young, and weak eyes strong—all through these wonderful bits of glass called lenses, perfected by science that men may see better and farther.

¶ The microscope, revealing all around us the swarming life of organisms too small to measure—

¶ The telescope lens, through which dim, distant stars draw near, and man explores the age-old mysteries of celestial cycles—

¶ The unerring camera lens, through which our modern world writes history in pictures—

¶ The projection lens, which translates still or moving pictures from slide or film to screen—

¶ Great searchlight mirrors, range-finders, gun-sights, binoculars, periscopes — the eyes of our fleet and our army.

¶ Ophthalmic (eyeglass) lenses, which correct eyesight, and add to life's richness and comfort—

¶ Precise and delicate instruments, for exact scientific research in many fields.

These suggest, but fall far short of measuring the countless services rendered daily to humanity by the world's largest manufacturers of lenses and optical instruments.

*Write for literature on any optical product in which you are interested.*

BAUSCH & LOMB OPTICAL COMPANY

*Makers of Eyeglass and Spectacle Lenses, Photographic Lenses, Microscopes, Balopticons, Binoculars, and Engineering and other Optical Instruments.*

Rochester, New York

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# Christmas Suggestions

## BUY YOUR CHRISTMAS GIFTS TODAY

Select your Diamond and Jewelry gifts from our 126-page Catalog Number 3G. Send your order for prompt shipment. Your credit is good. We trust you for all the goods you want on the

### Lyon Charge-Account-Plan

You pay nothing in advance—not one cent. Shipments are made at our expense and risk. You examine first and only after satisfied you send 20% as first payment. Then send only 10% monthly—at the rate of a few cents a day. You get full protection under our

### 8% Yearly Dividend Offer

Every "Lyon" Diamond is backed by our *binding guarantee*, covering the quality and value. MORE than that. On the exchange of any "Lyon" Diamond for a larger one, you get 8% YEARLY INCREASE IN VALUE—8% per annum MORE than what you paid.

### Our 75 Years' Reputation

guarantees you honest goods at lowest prices. If our Diamonds don't represent SUPERIOR VALUE, return at our expense. No obligation, annoyance, or red-tape. You don't pay a cent until you are pleased beyond your expectations. Send to Dept. 3G for our 126-page Christmas Bargain Catalog. Investigate our REMARKABLE OFFER. Let us explain how you can earn an EXTRA BONUS.

***Special cash discount of 15% for this month only***

**J. M. Lyon & Company, 1 Maiden Lane, New York**

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*KODAK* — the gift that helps to make her Christmas merry — then keeps a picture story of the Christmas merriment.

EASTMAN KODAK CO., ROCHESTER, N. Y., *The Kodak City*

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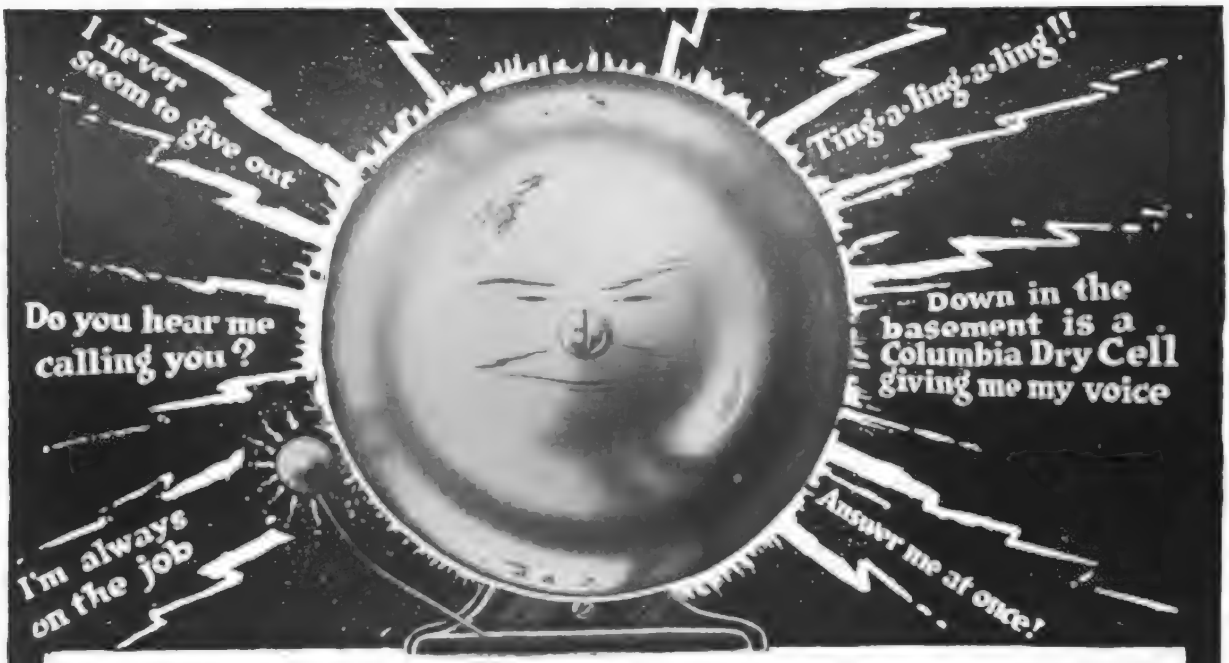


# You can Bet there's a Columbia Dry Battery back of this bell —

IT'S a sassy ring—an insistent ring—a ring that never fails. It's the lusty, vigorous ring that millions of Columbia Dry Batteries are pounding out in millions of homes day after day, year after year.

But these peppery little Columbias do more than make the lustier tone—they last longer. Yet they cost no more.

When the doorbell, buzzer, or other electric necessity about the house begins to yawn and quit, a new Columbia or two will give a new lease of life. . . . Don't ask for just "a battery"—make the man understand you want Columbia.

The Columbia Dry Battery does 71 jobs—from harp playing to egg testing. The universal uses are

—to ring doorbells—to light flashlights
—to buzz dining room buzzers
—to regulate the heat in homes
—to run toys for kiddies
—to make telephones speak up
—to ignite the power in autos, motorboats, and farm engines.

*For sale in every store where you would naturally inquire. Fahnestock Spring Clip Binding Posts, no extra charge.*

NATIONAL CARBON COMPANY, Inc.
Cleveland, Ohio
Canadian National Carbon Co., Limited
Toronto, Ontario

## THE STORAGE BATTERY

WHEN you buy a Storage Battery, look for the Pyramid Seal—it distinguishes Columbia from all others, and is the symbol of the famous Columbia Storage Battery guarantee of *definite power for a definite time.* . . . Any Columbia Service Dealer or Service Station will gladly explain to you the advantages that only Columbia Storage Batteries can give.

# Columbia Dry and Storage Batteries

J-19

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# *Mr. Smith had a horse—*

*Mr. Brown wanted to buy the horse, but he didn't know much about horses. Mr. Smith said if he didn't like the horse, he would give back Brown's money. But Mr. Brown figured that if the horse were right, Smith would let him try it out first, before he paid for it. So he didn't buy the horse, although he wanted it badly.*

We are not like Mr. Smith and his horse. We'll let you prove to yourself *before you buy* it that the 1900 Cataract Electric Washer saves time, money, work, and clothes. The 1900 dealer in your town will deliver a Cataract Washer right to your home. After you have tried it out, you may start paying for it on terms to suit your convenience. And it will pay for itself in the money you can save.

*Special Feature.* It is the magic figure 8 movement that makes the 1900 Cataract the perfect washing machine. By means of this the water is forced through the clothes in a figure 8 movement—four times as often as in the ordinary washer.

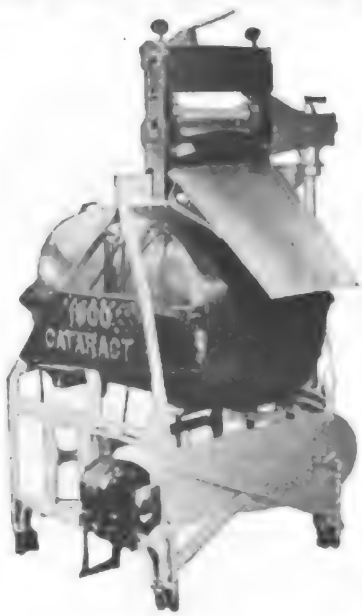
Fill out the coupon today. If you do not have electricity, write us about our other washers. We have them in many styles, and at all prices.

# 1900 CATARACT WASHER

**1900 WASHER COMPANY, Binghamton, N. Y.**
**Canadian Factory and Office, 357 Yonge Street, Toronto**

*No parts in the tub, and no heavy cylinders to lift out.*

*The swinging reversible wringer works electrically.*




*Comes in 8 and 12 sheet sizes*

*The water swirls through the tub in a figure 8 movement, and four times as often.*

**1900 Washer Company**
**Binghamton, N. Y.**

Please send me detailed information, and the name of the nearest 1900 dealer.

Name_____

Address_____

City and State_____



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# Champion

# Dependable Priming Plugs

## Equip Your Engine So It Sure-Fires When Cold

Champion Dependable Priming Plugs sure-fire cold motors because, with the priming cup right in the plug, the gasoline trickles down the core of the plug and drips from the sparking point where the spark jumps and is the hottest.

They are imperative in cold weather for the hundreds of thousands of cars that do not have priming cups, and are infinitely better for those that do, because priming cups let the gas in too far from the spark plug. Every car can be easily equipped with these plugs in a few minutes.

Get a set of Champion Dependable Priming Plugs from your dealer, and insure easy starting in cold weather. Price $1.50 each.

**Champion Spark Plug Company, Toledo, Ohio**

*Champion Spark Plug Co. of Canada, Limited, Windsor, Ontario*

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# Are You Using Tubing in Short Lengths?

As large manufacturers of light gauge steel tubing we accumulate great quantities of short lengths.

We offer this first class material at attractive prices.

SIZES

From ¼ in. to 3 in. Outside Diameter.
From 11 to 22 gauge.
Lengths 2 feet and under.

Facilities for forming to various shapes.

Send us your inquiries.

STANDARD WELDING DIVISION
THE STANDARD PARTS COMPANY
CLEVELAND, OHIO

Stan-Par PRODUCTS *Include Axles, Bearings, Springs, Rims, Tubing, Tubular Parts, Gear Rings, Rods and Rod Assemblies for the Automotive, Vehicle, and other Industries.*


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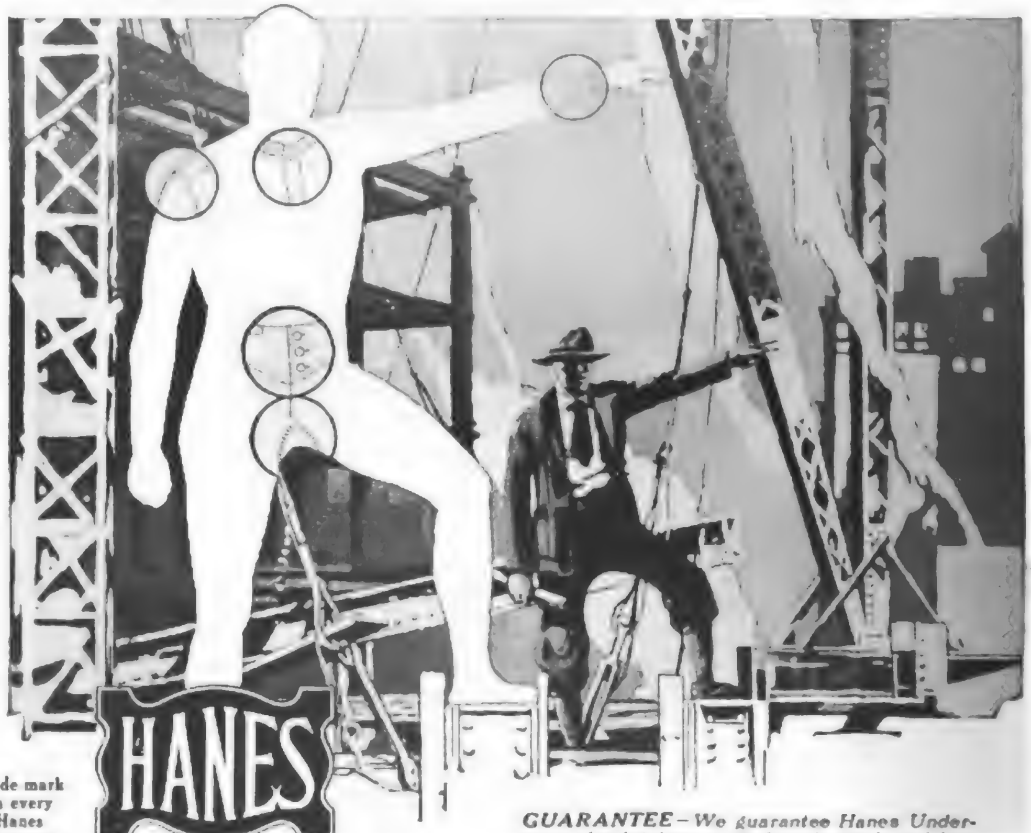


Trade mark on every Hanes Garment

ELASTIC KNIT
UNDERWEAR

*GUARANTEE*—*We guarantee Hanes Underwear absolutely—every thread, stitch and button. We guarantee to return your money or give you a new garment if any seam breaks.*

# Quality and care put into Hanes Underwear will astound any man!

YOU'D rate Hanes winter Men's Union Suits and Shirts and Drawers *sensational value* if you followed the bales of fine, long-staple cotton from the moment they entered the Hanes Plant until you saw Hanes Underwear packed into boxes for shipment all over the nation!

*What goes into Hanes in quality and workmanship comes out to you in extra-wear, extra-comfort, extra-warmth!* We tell you frankly that Hanes is the biggest underwear value ever sold at any price! *Prove our statement for your own satisfaction!*

Read every detail and compare with the circles in the diagram figure above, because you should understand what Hanes hands you: *Guaranteed* unbreakable seams, with reinforcements at buttonholes and at every strain point; elastic knit collarette that snugs up to the neck, preventing gaps; shape-holding elastic knit shoulders that "give and take"; durable, snug-fitting three-button sateen waistband; elastic knit wrists; pearl buttons sewed on to stay! Put behind that array of wear and comfort features Hanes perfect workmanship and *Hanes quality!*

Hanes Union Suits have never been near-equaled at the price. They have all the desirable features of Hanes Shirts and Drawers *with a closed crotch that stays closed!*

**"Hanes" Union Suits for Boys** are as wonderful value as our men's garments. To mothers and fathers Hanes boys' Union Suits are superb. Cozy, fleecy warmth and the finest workmanship put these boys' suits in a class distinct from all others. *They certainly do stand the wear and wash!*

See this Hanes Underwear at your dealer's. If he cannot supply you, write us immediately. *Any Hanes garment will outlive our guarantee!*

**P. H. HANES KNITTING CO., Winston-Salem, N. C.** New York Office 366 Broadway

*Warning to the Trade*—Any garment offered as "Hanes" is a substitute unless it bears the Hanes label.

*Please Mention Popular Mechanics*

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# W. L. Douglas

"THE SHOE THAT HOLDS ITS SHAPE"

**$5.00 $6.00 $7.00 $8.00 $9.00 & $10.00**




You can save money by wearing W. L. Douglas shoes, the best known shoes in the world. Sold by 106 W. L. Douglas own stores and over 9000 shoe dealers. W. L. Douglas name and the retail price stamped on the bottom guarantees the best shoes in style, comfort and service that can be produced for the price.

The stamped price is W. L. Douglas personal guarantee that the shoes are always worth the price paid for them. The prices are the same everywhere—they cost no more in San Francisco than they do in New York.

**W. L. Douglas shoes are sold through our own stores direct to the wearer at one profit. All middlemen's and manufacturing profits are eliminated. By this method of marketing our shoes, W. L. Douglas gives the wearer shoes at the lowest possible cost.**

**W. L. Douglas $7.00 and $8.00 shoes are absolutely the best shoe values for the money in this country. They are the leaders everywhere. W. L. Douglas $9.00 and $10.00 shoes are made throughout of the finest leather the market affords, with a style endorsed by the leaders of America's fashion centers; they combine quality, style and comfort equal to other makes selling at higher prices.**

**W. L. Douglas shoes are made by the highest paid, skilled shoemakers, under the direction and supervision of experienced men, all working with an honest determination to make the best shoes for the price that money can buy.**

**CAUTION**

**Insist upon having W. L. Douglas shoes with his name and price stamped on the bottom.**

If W. L. Douglas shoes cannot be obtained in your vicinity, order direct from factory by mail, Parcel Post charges prepaid. Write for Illustrated Catalog showing how to order by mail.

W. L. Douglas

President W. L. DOUGLAS SHOE CO.
128 Spark St., Brockton, Mass.



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# The New Indian

Here it is—the new INDIAN Scout Model G-20! The practical motorcycle for the thousands! The motorcycle of the future! New in conception—new in design—new in construction—new in a hundred important details.

Vision and courage built it—made it powerful, strong and sturdy like its famous predecessors in the INDIAN line—made it one hundred pounds lighter than its big brother—the INDIAN Powerplus.

Beautiful, well balanced and mechanically perfect, the new INDIAN Scout sets the high water mark as an ideal middleweight motorcycle. It's evolutionary in that some principles of design of the past have been discarded and new theories of construction, assured by gruelling, practical experience, have been incorporated.

And INDIAN dealers the world over have taken to the INDIAN Scout like wild fire. Personal visits to the factory and peremptory orders for deliveries, rush orders by telegram and letter and cable from far points from dealers, even before seeing the demonstrating model, have assured a wonderful production for 1920.

But the new marvelous middleweight model is only one feature of the new season's INDIAN line. A wonderfully improved bigger valved INDIAN Powerplus with exclusive Cradle Spring Frame for the maximum in power and speed and riding comfort, and the electrically equipped INDIAN Powerplus with two unit ignition and lighting system are outstanding features of the INDIAN 1920 motorcycle offerings.

INDIAN Leadership—supreme for many years—is now assured for all the years to come.

See your INDIAN dealer *today*. *Phone* him. Get an immediate demonstration of the motorcycle marvels.

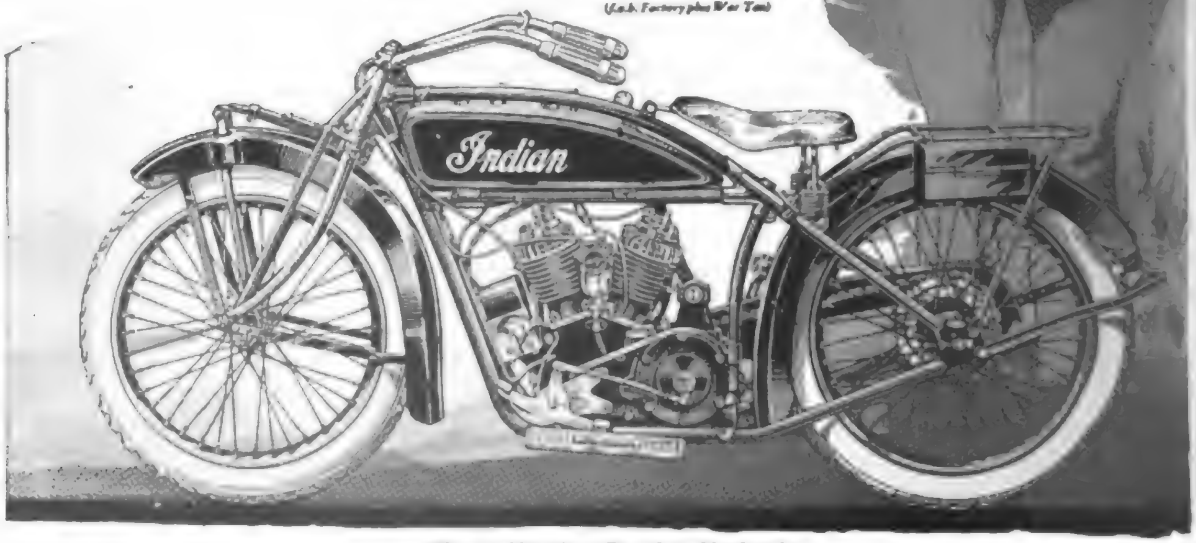
HENDEE MANUFACTURING COMPANY

Dept. 37, SPRINGFIELD, MASS.

*The Largest Motorcycle Manufacturer in the World*

**PRICES:**

Model G-20 — $295
Model N-20 — $360
Model NE-20 — $390
*(f.o.b. Factory plus War Tax)*




*Please Mention Popular Mechanics*

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# Money-Back Cartridges

U. S. Cartridges are sold with the broadest guarantee ever made on ammunition. It is simply this: If you don't like them, get your money back.

We have authorized every dealer who carries U. S. Cartridges to refund, on demand, the price of the whole box to anyone who doesn't like them, and returns the unused part of the box.

## US CARTRIDGES

**For all makes of firearms**

There is no 22 Long Rifle cartridge as accurate at all distances from 50 to 250 yards as U. S. 22 N. R. A. Long Rifle Lesmok Cartridges. This is 50 more yards of accuracy than has hitherto been possible with 22 rim-fire ammunition.

Solid bullet for target work. Hollow-point bullet for small game. Cost no more than ordinary cartridges. *Send for a copy of The U. S. Game Law Book—Free.*

**UNITED STATES CARTRIDGE COMPANY, 111 Broadway, New York**

We make exactly the same guarantee with

**US BLACK SHELLS**
Smokeless and Black Powders

You can get your pet load in smokeless or black powder in The Black Shells and your money back if you want it.

Thousands of shooters claim they take less "lead," shoot closer, with The Black Shells because they are as quick as lightning. They are positively waterproof, too.

General Selling Agents: National Lead Company, Boston, Buffalo, Cleveland, Chicago, St. Louis, Cincinnati; United Lead Company, New York, Philadelphia; National Lead and Oil Company, Pittsburgh; James Robertson Lead Co., Baltimore; American Smelters Securities Co., San Francisco; Hingston-Smith Arms Co., Winnipeg; John Hallam, Ltd., Toronto.



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# To Owners of AC-Equipped Cars

Is your engine running as smoothly or as powerfully as you have the right to expect?

If not, ask yourself whether you have played fair with the manufacturer of the car you drive.

Do you always insist that your dealer give you AC Spark Plugs when you ask for them—or do you permit him to sell you something "just as good"?

The manufacturer of your car chose AC Spark Plugs as standard equipment because he found AC Spark Plugs best suited to the needs of his product.

His choice was the result of exacting tests conducted by his chief engineers—tests in which all other plugs had the opportunity to qualify.

The manufacturer knows how important the proper spark plug is in the successful functioning of his engine. Profit by his experience; follow his judgment; always demand and get AC Spark Plugs.

Most fine passenger cars and most trucks and tractors of established reputation have AC's as standard equipment.

No matter what car you drive you can secure an AC Spark Plug that has been specially designed for it. For there are various types of AC Spark Plugs designed for every make and style of engine.

Champion Ignition Company
FLINT, *Michigan*

U. S. Pat. No. 1,135,727, April 13, 1915, U. S. Pat. No. 1,216,139, Feb. 13, 1917, Other Patents Pending

*The Standard Spark Plug of the World*

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# To the Country Every Sunday With Your "World's Champion"

To your favorite lake or stream or country resort—hunting, fishing, or just touring—every Sunday is a real vacation when you have a Harley-Davidson.

The whole countryside is yours to enjoy, for miles mean just pleasant minutes when you ride "The World's Champion." You will ride it to work and back every day, skimming past the crowds and the street cars; you'll spin out into the country 'most every evening after supper, and when Saturday comes—Oh, boy!—over the hills and away you go!

## Harley-Davidson

**"World's Champion"**

is the cheapest form of quick travel—40 to 60 miles on a gallon of gasoline—its cost of upkeep, fuel and tires should never bother you.

Speed? Dependability? Read over the record of recent Harley-Davidson triumphs on track and road and judge for yourself.

You appreciate mechanical excellence. Let the Harley-Davidson dealer show you the kind of workmanship that goes into this motorcycle. Ask him about his easy payment plan.

## Harley-Davidson Motor Co.

**Milwaukee, Wisconsin**

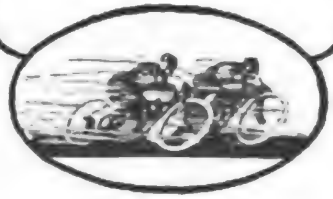
National Champion
**World's Champion**

Harley-Davidson won 200-mile National Championship at Ascot Speedway, Los Angeles, June 22nd. Won all five places.

Harley-Davidson won 200-mile World's Championship, Marion, Indiana, September 1st. Finished first, second, third.

Harley-Davidson holds Three-Flag Record (Canada to Mexico) for both Heavy and Medium-Weight machines.

Harley-Davidson holds New York to Chicago record.





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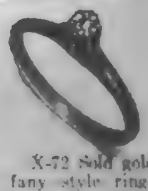
# BUY TODAY 10 MONTHS TO PAY

X-68 Massive flat Belcher ring; one fine diamond $60

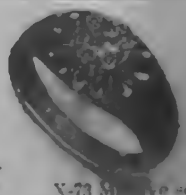
X-69 Twelve beautiful diamonds, platinum set surround a blue faceted sapphire. $115

X-70 One sparkling blue-white diamond set Tiffany style. $75.

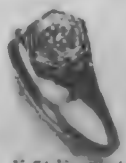
X-71 Graceful pattern of white gold, set with seven perfectly cut, blue-white diamonds. $85.



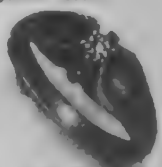
X-72 Solid gold Tiffany style ring; one blue-white diamond. $45.



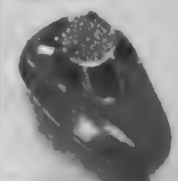
X-73 Massive seven-diamond cluster ring. $85



X-74 Exquisite diamond, hexagon-set in platinum mounting. $125.



X-75 Gentlemen's solid gold tooth ring, set with one fine diamond. $50.



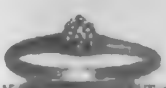
X-76 Gentlemen's massive seven-diamond platinum-set cluster ring. $75.

X-77 Pretty lavalliere set with one fine diamond and one genuine white pearl $25

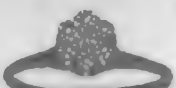
X-78 Tiffany style solid gold ring; one fine diamond. $100.

X-79 Ladies' Belcher ring set with one fine diamond $35

X-80 "Merry Widow" style, five perfectly cut platinum-set diamond $100



X-81 Solid gold Tiffany style ring; one fine diamond. $25



X-82 Ladies' seven-diamond platinum-set cluster ring. $85

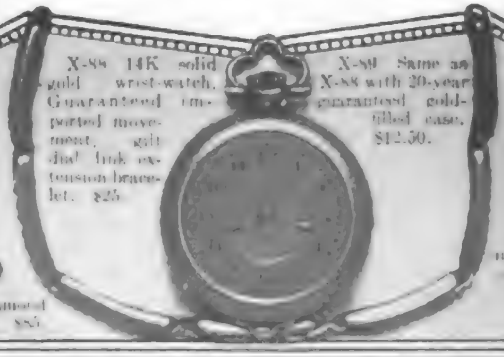
## Xmas Selections
### on Credit at Cash Prices

Any of these Splendid SWEET Specials sent ON APPROVAL at our expense. If entirely satisfied after examination, pay only ⅛ of price; **balance in ten monthly payments.** SWEET'S Policy: You must be satisfied or no sale.

Every Diamond of Superior quality, blue-white, perfect-cut. PROFIT-SHARING PLAN. We accept SWEET Diamonds in exchange at full price, plus 7 ½% yearly increase in value. ***Liberty Bonds accepted at face value.***

**FREE** 128-Page De Luxe Catalogue of Xmas Suggestions

Select your gift before Christmas and get it on credit. Maiden Lane's greatest collection of precious gems, watches, jewelry, silverware, etc., beautifully illustrated. **Ten months to pay on everything. Write TODAY to Dept. 69 T.**



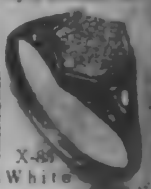
X-88 14K solid gold wrist-watch. Guaranteed imported movement, gold dial, link extension bracelet. $25

X-89 Same as X-88 with 20-year guaranteed gold-filled case. $12.50.

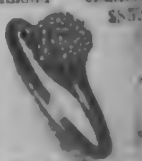
X-87 Gentleman's massive Belcher ring; one fine diamond $50

X-83 Beautiful mounting of green and white gold, one fine diamond hexagon-set $60

X-84 One fine diamond Tiffany style set in $85



X-85 White gold, seven-diamond cluster. $85



X-86 Ladies' seven-diamond platinum-set cluster ring $95

# L·W·SWEET & CO. INC. "THE HOUSE OF QUALITY" 2-4 MAIDEN LANE, N.Y.

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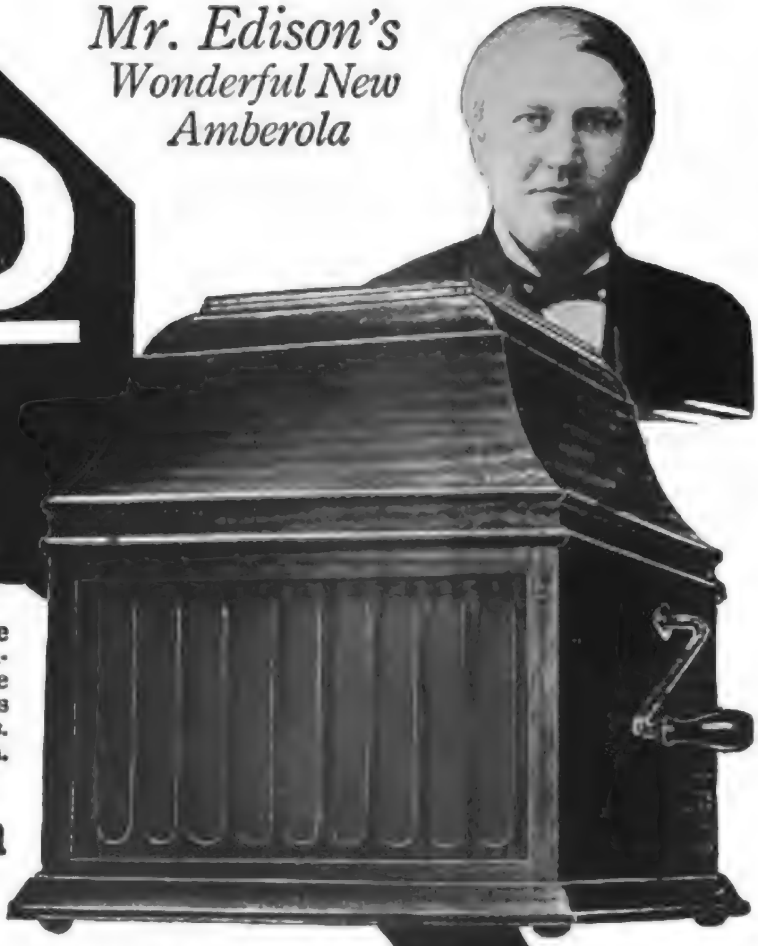
# Only $100 and After Trial

*Mr. Edison's Wonderful New Amberola*



**Yes, we will send you the New Edison Amberola, the product of the world's greatest inventor's genius, the phonograph with the wonderful diamond stylus reproducer and your choice of the latest Diamond Amberol Records on *free trial without a penny down. Seize this opportunity.* Send coupon.**

## Rock-Bottom Offer Direct

If, after the free trial, you decide to keep Mr. Edison's superb new instrument, send us only $1.00. Pay the balance on the easiest kind of monthly payments. Think of it — a $1.00 payment, and a few dollars a month to get this wonderful new style outfit — Mr. Edison's great phonograph with the diamond stylus reproducer, all the musical results of the highest price outfits — yes, the greatest value for $1.00 down, balance on easiest monthly terms. Convince yourself—free trial first! No money down; no C. O. D., not one cent to pay unless you choose to keep the instrument.

*New Edison Amberola in Your Home on Free Trial*

Entertain your family and friends with the latest song hits, with your favorite, old-time melodies — with everything from grand opera to comic vaudeville. Roar with laughter at the side-splitting minstrel shows. Then, after the trial, send it back at our expense if you choose. Or keep it on our great, rock-bottom offer. ***Send the coupon now.***

## New Edison Catalog FREE

Your name and address on a postal or a letter (or just the free coupon) is enough. No obligation in asking for catalog. Find out about Mr. Edison's great new phonograph. Get the details of this offer—*while this offer lasts.* Write today—now.

**F. K. BABSON, Edison Phonograph Dists.**
**1359 Edison Block, Chicago, Illinois**

***Canadian Office:*** **355 Portage Ave., Winnipeg, Manitoba**

*To* **F. K. BABSON, Edison Phonograph Dists.**
**1359 Edison Block, Chicago, Illinois**

Gentlemen: Please send me your New Edison Catalog and full particulars of your free trial offer on the new model Edison Amberola.

*Name* _____

*Address* _____

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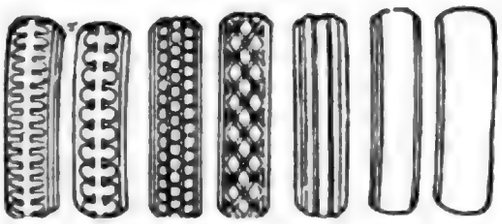
# LEARN VULCANIZING and ANTI-SKID RETREADING FREE OF CHARGE OR OBLIGATION




We have schools located in all sections of the Country where we teach prospective purchasers of our equipment how to do

**Anti-Skid Retreading and General Tire Repairing FREE OF CHARGE OR OBLIGATION**

## Let Us Show You How to Start Making More MONEY THAN YOU EVER DID BEFORE!

**You Will Be Independent and Have Your Own Business in the Automobile Field Which Is Growing Larger Every Day**

Model A Equipment

***We Can Furnish Our***

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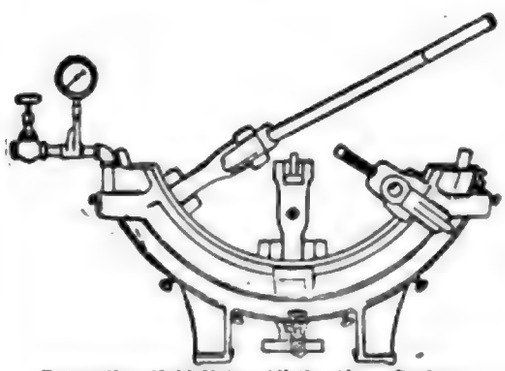
that will do any job that comes into your Tire Shop from Section Work to Retreading Complete with bead plates, Anti-Skid Matrices, Boiler and Fittings ready to use. **Price $387.00, with gas burner. F. O. B. CHICAGO**



Retreading Mold Makes All the Above Designs

There is no business other than Vulcanizing and Retreading that will make you as much money with so small investment and short experience.

Write in and we will send you introductory card to the nearest school to your location. This is a chance of a lifetime. All you need is the ambition to get in business for yourself with enough capital to purchase our equipment.

**We Make a Complete Line of Vulcanizing Equipment, Section Molds, Retread Molds, Boilers, Tread Peelers, etc.**

***Send for Our Latest Catalogues***

## WESTERN TIRE & RUBBER WORKS

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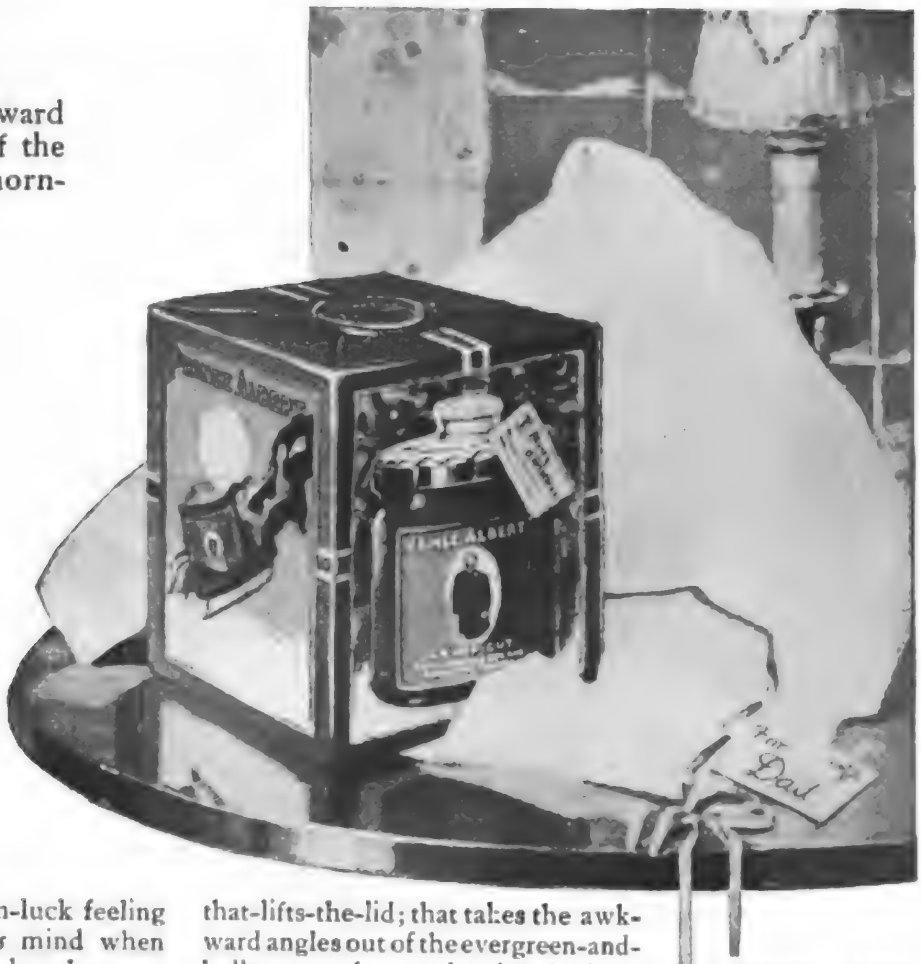
TAKING awkward angles out of the early Christmas morning atmosphere!




HOW that low-on-luck feeling will peel off *his* mind when the happy-handout-happens Christmas morning; and, his keen eye sights the stage all set with the pound crystal glass humidor of Prince Albert tobacco gowned in the glories of a radiant holiday rainbow! Turkey takes to the tall timbers compared with the all-star-feast *you* spread so temptingly before his smokeappetite!

PRINCE ALBERT for Christmas, lands on a man's tank-of-thanks like a spill-of-snow when the sleigh-bells are rusty from lack of jingles! P.A. asa *man-gift* isthehigh-sign, the last word, the directest route to his comfort, his contentment, his smoke-happiness! It's the touch-that-lifts-the-lid; that takes the awkward angles out of the evergreen-and-holly atmosphere and makes the family think and talk in one language!

YOU'LL enjoy seeing *him* fuss his old jimmy pipe all brimful with Prince Albert! Or *getting his* "rolling his own!" Never was such a delightful makin's cigarette as P.A. supplies! He can smoke the limit with Prince Albert *for it can't bite his tongue or parch his throat!* Our exclusive patented process fixes that! He'll just want to get thirty-six-smoke-hours out of the legal twenty-four, *that's all!*

FILL his smokecup to overflowing! Prince Albert will hum a smoke te-de, te-dum long, long after Christmas is but a merry memory!

PRINCE ALBERT

*the national Christmas joy smoke*

PRINCE ALBERT is also sold in handsome pound and half pound tin humidors, in tidy red tins and in toppy red bags—wherever you buy tobacco.

R. J. REYNOLDS TOBACCO CO. Winston-Salem, N.C.

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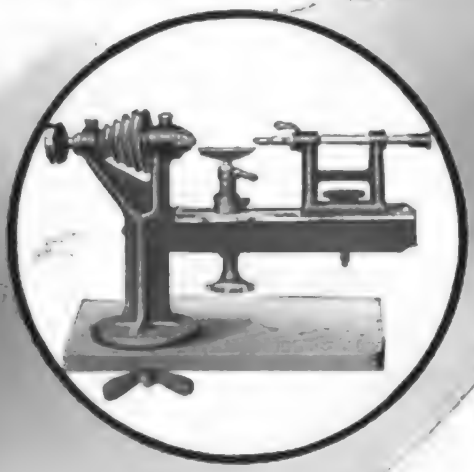
# GOODELL-PRATT
## 1500 GOOD TOOLS



## Precision Model Lathe No. 700

This lathe is particularly adapted to small precision work such as is usually done in the laboratory. Doctors, dentists and inventors will find it exceedingly useful in their laboratories.

This lathe has a 12-inch bed and an extreme distance of 3⅓ inches between centers. It swings 5 inches. It has a draw-in spindle with a 3/16-inch hole clear through. The pulley has four steps for ¼-inch round belting. The Compound Slide Rest, Boring Attachment, Sawing Attachment and Milling Attachment shown in the circles, are intended for use with Precision Model Lathe No. 700. With these attachments an almost unlimited scope of work can be accurately and quickly accomplished.

The policy of designing each tool to fulfill a definite purpose and the determination to make every tool the best of its kind have resulted in mechanics the world over demanding the Goodell-Pratt name on their tools.

Ask your dealer to show you this lathe or write for a more complete description of it or any of the other 1500 Goodell-Pratt Tools.

GOODELL-PRATT COMPANY

*Toolsmiths*

Greenfield, Mass., U. S. A.

GOODELL-PRATT COMPANY Greenfield, Mass., U.S.A.

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# DISSTON
## SAWS AND TOOLS

### Disston Saws Are Used All Over the World

Disstons have been making saws continuously on a larger and larger scale ever since 1840.

More and more large industrial users are using Disston Saws exclusively; in this competitive field the Disston is as much the Leader as it is with the great body of individual users.

Whatever kind of a saw *you* use—Cross-Cut, Circular, Band, or Hand Saw—Disston makes it—and you will find the Disston name a guarantee of quality. Every Disston Saw and Tool is made from Disston Crucible Steel, specially made in the Disston plant.

*Disston Saws are sold by progressive dealers all over the world—many of them featuring the Disston exclusively.*

Send for the free Disston Handbook on Saws; learn how to select, use, and care for Disston Saws and Tools.

**HENRY DISSTON & SONS, Inc.**

*"America's Largest and Longest-Established Makers of Hand Saws, Cross-Cut Saws, Band-Saws, Circular Saws, and Tools"*

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*"Largest Saw Factory in the World"*

## DISSTON-THE SAW MOST CARPENTERS USE

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# To cut down the cost per cut

## Follow the Chart

**Make your hack sawing just as efficient as any other machine tool operation. Choose your blade according to your work. You can't cut cold-rolled and heavy angle iron with the same blade without a waste. Whether you are cutting by power or by hand, big quantities of a comparatively few kinds and shapes of metal or smaller quantities of a lot of different things—there's a Starrett Hack Saw that will meet your needs most efficiently.**

Get the most out of every box of saws you buy. Use them for the purpose for which they were made.

A copy of the Starrett Hack Saw Chart "AP" sent free upon request.

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

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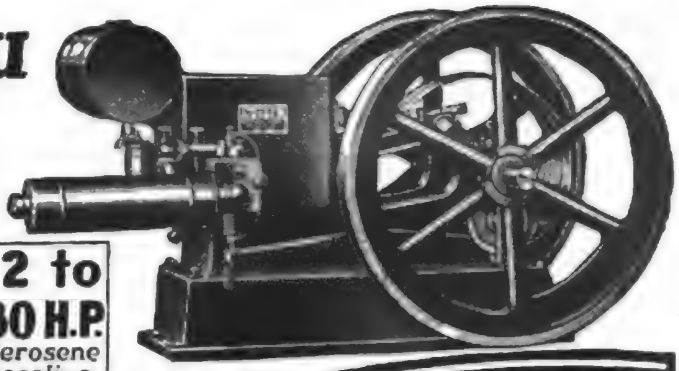
# I Will Sell You An ENGINE On Practically Your Own Terms



2 to 30 H.P. Kerosene Gasoline

Cash or Easy Payments as You Wish

# LOW FACTORY PRICES

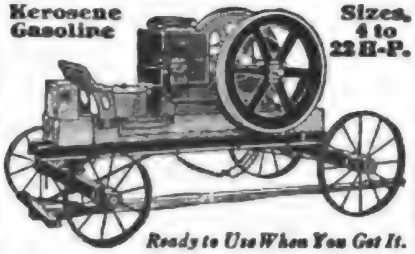
## SAVE $15 to $200

Buy your engine NOW while you can get it at a big saving. Write for latest Witte book and newest price list. Don't pay more than I ask in order to get a good engine, or take an inferior or poorly built one to save money. My Special Kerosene Engine, shown above, is just as easy to operate on coal oil, distillate or gasoline, as any gasoline engine. Fuel costs a half less. No complicated parts—everything easy to understand. WITTE Engines have few working parts; they are easy to start or stop and easy to adjust. When started, they need little attention. You get surplus power automatically. Engine burns fuel according to load. Speed regulator is built in—costs you nothing extra. Engine is fully equipped, ready to use when you get it. I guarantee safe delivery anywhere in the United States.

## WITTE PORTABLES

Kerosene Gasoline

Sizes, 4 to 22 H-P.



*Ready to Use When You Get It.*

## WITTE SAW-RIGS

A Money Maker. All Steel Trucks—Ready to use when you get it, with saw, saw frame, pulley, belt, tongue, seat and chain brake, as shown.

Sizes, 4 to 16 H-P.

A 3-in-1 Outfit

Get My Prices

## Write Me Today

Before you agree to take any engine, get my new book and prices on 2 to 30 H-P.—Stationary, Portable and Saw-Rig Outfits. I save you money and time. I can make immediate shipment.—ED. H. WITTE, President.

# WITTE ENGINES

**Built in Sizes 2, 3, 4, 6, 8, 12, 16, 22 and 30 H. P.**

**High Tension Ignition—Batteries or Magneto**

I claim that no one can sell you a stronger, better designed, or more economical engine to operate than I can at direct-from-factory price. There are now more than 60 points of superiority in WITTE Engines. Every point has proven good during my 33-year record as an engine builder. That record in itself is your best guarantee of engine quality and engine reliability. No better illustration of the high quality of material used can be given than the fact that every WITTE Engine is NOW

## Sold on a Lifetime Guarantee

Not one year, five, or ten years, but a guarantee whereby a factory replacement is made on any defective part during the entire life of the engine as long as you use it. I could not make this lifetime guarantee if I did not know what WITTE Engines actually do under all sorts of working conditions. Some of my first engines, over 33 years old, are still going as good as ever, proving unusual durability with low cost of upkeep and low fuel cost.

**Immediate Shipment** For complete information and prices, write for my latest and best Engine Book, "HOW TO JUDGE ENGINES," by return mail, FREE. Read this valuable and instructive book before you decide on any style of engine. I know it will save you money. —ED. H. WITTE, Pres.

## WITTE ENGINE WORKS

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## This Book FREE

Sign and Mail COUPON No. 1749

ED H. WITTE:

Dear Sir: Please send, without obligation on my part, your latest ENGINE BOOK and new list of prices.

Name_____

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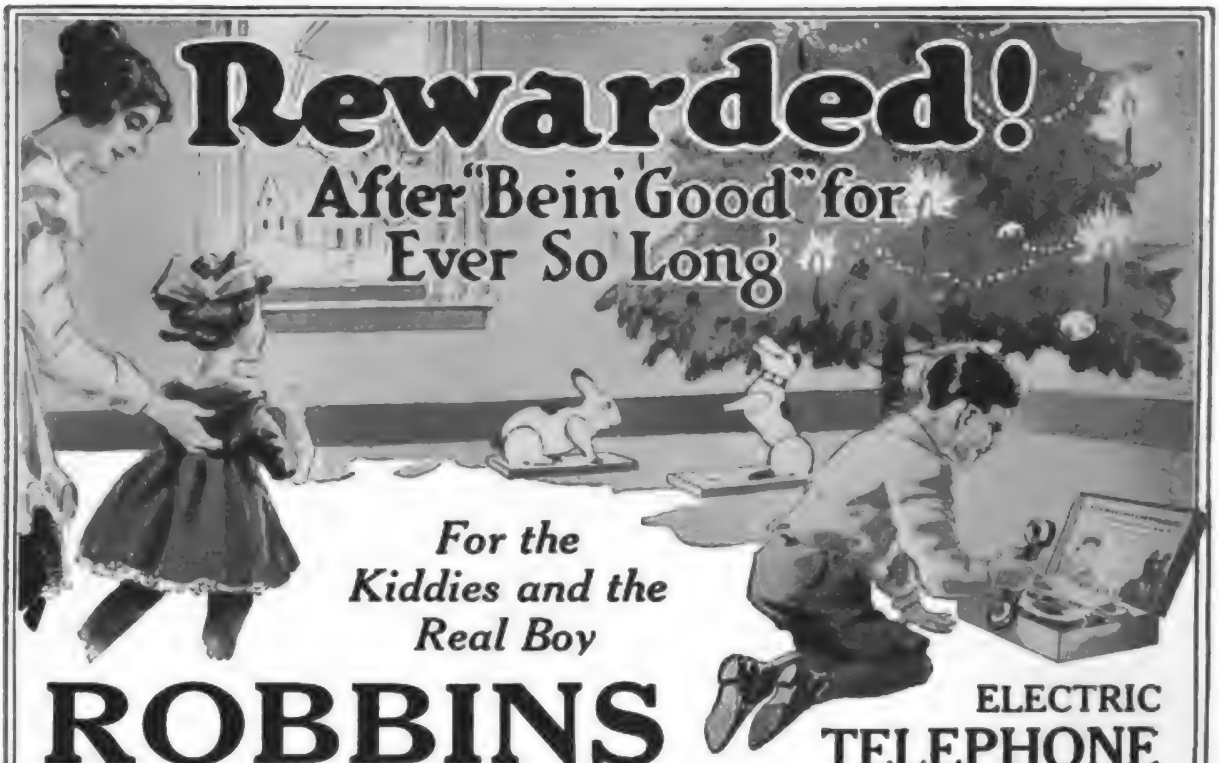

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## After "Bein' Good" for Ever So Long'

*For the Kiddies and the Real Boy*

# ROBBINS ELECTRIC TELEPHONE

## PERFORMING ANIMALS

Little children clap their hands and even grown-ups smile at the amusing alertness with which these clever Performing Animals "sit up" or "kick up." Just a tap on the base and they spring to position. When pushed down they hold the normal position until again released.

Robbins Performing Animals have won thousands of children's happy hearts. They are original American ideas and American Manufacture. At a small cost they will delight the children you are buying them for.

See that they are present under your tree on Christmas morning.

CHOICE OF 3 ANIMALS
DOG-MULE-RABBIT

## *Every Lively Boy Wants One*

A Private Electric Telephone Line all your own. Here's your chance. Make this wonderful telephone set a most absorbing educational part of your games and spare hours.

The Robbins Electric Telephone Set is a *real* American made telephone, scientifically perfect and complete. It can be used anywhere that your imagination suggests—from room to room, to a chum's house, outdoors in "Scouting" and games or in any number of ways. Operates on dry batteries, so is independent of any other current. Complete instructions with each set. Thousands of boys now include this set among their most precious treasures. See that the Robbins Telephone set is a part of your "wants" for this Christmas.

Write us now for a copy of Robbins Telephone Manual—sent FREE

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your dealer doesn't have them, he can easily obtain them for you. We mail the Robbins Telephone Set to any address postpaid upon receipt of **$2.00.** Make it a point to get ROBBINS, the best and most interesting of American Made Toys, this Christmas.

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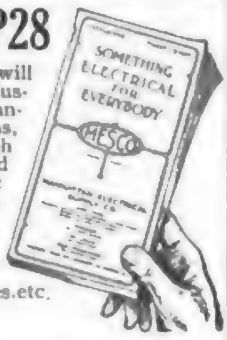
It will be pocket size, 8x4½, and will contain 248 pages with over 1,100 illustrations, describing in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, etc.

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*References by permission: Dun's or Bradstreet's; Marine National Bank; Union Trust Co.; Bank of Pittsburgh, N. A., Pittsburgh, Pa.*

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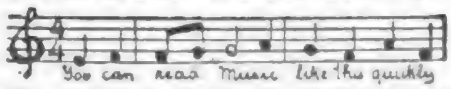


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**This $2 KNIFE $1.38 Postpaid**
**Hand Forged Razor Steel Blades**

Handy shaped blade makes this knife best for mechanics, sportsmen and farmers. Light but strong, re-sharpened easily. Stag handle. German silver polish, blades tile tested, hand forged from razor steel and warranted.

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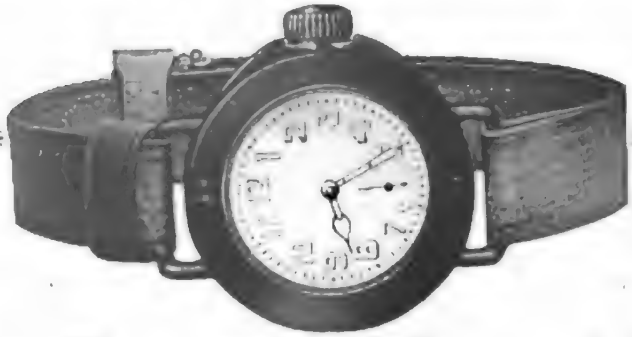


*Waltham Movement*

*Prestige Accuracy*

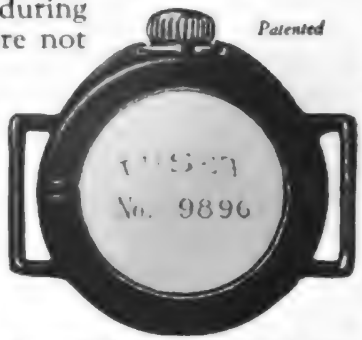
# The Depollier Waterproof and Dustproof Strap Watch

**FIELD AND MARINE**

*Registered U. S. Pat. Off.*

The Depollier Waterproof Case now adopted by the Signal Corps of the United States Army for the saving of watch movements purchased during the war and for future use. Ordinary strap watches were not constructed to withstand the wear and tear of field duty. A heat-insulated disk protects the delicate movement from the injurious body heat of the arm, which has a tendency to dry or gum up the watch oil.

**Waterproof Oxidized Case with 14-k Solid Gold Disk on Back and 15-J Waltham Movement . . . . . $45.00**

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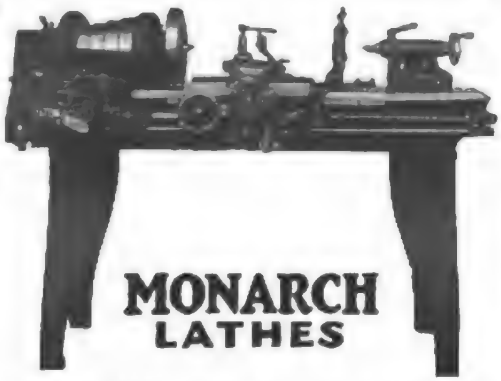
15 Maiden Lane - New York, N. Y.

Dubois Watch Case Company, Established 1877



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QUALITY construction and workmanship. Accuracy in operation and the ability to perform the same high class work as that of the more costly tool has established the leadership of the monarch line.

Quantity production of a high grade machine tool has made possible the low prices that place the MONARCH lathes within the reach of every large or small purchaser.

Made up to 30" swing, there is a Monarch lathe to do your work. Every one guaranteed to give satisfaction to the purchaser. **Write for catalog No. 11.**

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**The Monarch Machine Tool Co.**
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AND ASSOCIATED COMPANIES
*One Policy One System Universal Service*

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**THE 20th CENTURY LITTLE WONDER**

Moistens stamps and envelopes neatly and quickly. Handier and cheaper than any other stationery moistening device on the market. Our guaranty with every one provides for money back if not satisfactory. You take no chances on the Argus. Try it. **Price, Prepaid. . . . $1.50.**

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Mostly sold through recommendation. For PERSONAL DESK or GENERAL OFFICE. It checks mental calculations. Buy through your Stationer. Write for 10-day trial offer.

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**AGENTS WANTED**

**Golden Gem PORTABLE Adding Machine $12**

Your WDC Pipe is bound to break in sweet and mellow, because it was made of specially Demuth seasoned French briar. It is unsurpassed in workmanship because it was fashioned by contented, self-governed workmen. And for these reasons it will give you the better kind of smoke. All good dealers sell WDC Pipes in your size and shape, and at your price.

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WORLD'S LARGEST MAKERS OF FINE PIPES

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Stick

# Fine as silk!

The velvety Williams' lather leaves your face feeling fine as silk.

It sends you down to an early breakfast with a merry smile and a sense of complete comfort that starts the day right.

You don't really need as thick a mass of lather as the Williams' stick will give you if you want it. But some morning, just for fun, take a little extra time for working up the lather, and a little additional water, and see how rich and generous the Williams' lather can be.

But *every* day you get the same quick and soothing results—a shave that leaves no hard feelings.

The patented holder-top stick is an added convenience that grows greater the longer you use it.

Send 20c. in stamps for trial sizes of the four forms of shaving soap — Cream, Stick, Powder and Liquid. Or send 6c. in stamps for any one.

**The J. B. WILLIAMS COMPANY**
***Dept. A, Glastonbury, Conn.***

After the shave or the bath, you will enjoy the comforting touch of Williams' Talc Powder. Send 4c. for a trial size of the perfume you prefer—Violet, Carnation, English Lilac or Rose.

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Powder



Liquid

# Williams' PATENTED Holder Top Shaving Stick

THE J.B.WILLIAMS CO. GLASTONBURY, CONN.

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# You Can See The Spark
## In The Top Of The Plug

The increased efficiency Viz-Sparks give to your motor is little short of marvelous. You'll scarcely believe it till you try them—and then you'll be so enthusiastic you'll want all your friends to have them. You can see the spark through a lens in the top of the plug—and you can not only see at a glance whether the plug is sparking, but the color and size of your spark accurately indicates the condition of your ignition. All this, together with proof of how Viz-Sparks give you an intensified spark, told in a little booklet which your dealer will give or we will send you by mail.

# VIZ-SPARK

***"The Plug With the Double Jump Spark"***

Viz-Spark is an improved spark plug. It is as much of an advance over the average plug as the self-starter is an improvement over the crank start. You wouldn't think of abandoning your self-starter, and once you try Viz-Sparks you could not be induced to go back to other style plugs. This is a fact proven by the experience of thousands of users. In addition to visibility you absolutely and positively get a greatly intensified spark — ***and you know what that means!***

We want you to try Viz-Sparks, and if your dealer cannot supply you, order by mail. Give model of car and size of plug when ordering. Also, we will appreciate it if you will give us the name and address of your dealer.

## What Viz-Spark Does

The intensified firing spark insures complete combustion;—
Complete combustion reduces carbon deposit to a minimum—
Complete combustion eliminates the fouling of plugs—
Complete combustion prevents sticking of valves—
Complete combustion eliminates necessity of frequent valve grinding—
Complete combustion makes possible a lean gasoline mixture—
Complete combustion insures gasoline economy—
Complete combustion insures maximum power under all conditions.
Intense firing spark makes cold weather starting easy.

## What Viz-Spark Shows

A visible spark in the top of the plug shows the condition of the ignition and combustion system of the motor. The additional gap in the plug reduces the current taken from the battery to a minimum.

A small bluish white spark, when uniform on all plugs, indicates uniform compression and ignition on all cylinders.

A larger yellowish spark on one or more plugs indicates loss of compression or excess of oil in corresponding cylinder.

A large red spark indicates that the plug is not firing.

No spark indicates an open circuit in the wiring or distributor.

**Guarantee** **Viz-Spark** is built to last as long as the motor. Should any defect develop within one year from the date of purchase, return the plug to us and we will repair or replace it free of charge.

***Dealers and Distributors, Write Us***

## Visible Spark Plug Co.

406 McKenna Bldg., Pittsburgh, Pa.

**Price**
**$1.50**
**Mail Orders Filled Where Dealers Cannot Supply You**

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# Saved From Such a Fate By
# PRESTO-FELT

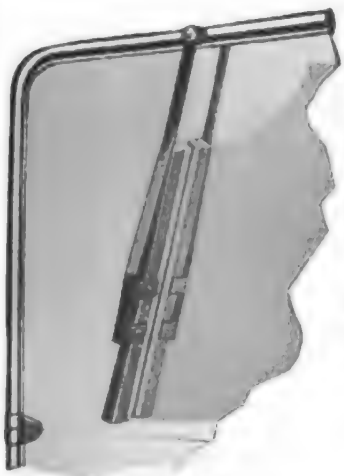
## "The Windshield Cleaner That Fits Any Car"

Made to attach in any of three ways—clamps over top of windshield, bolts through frame or through the glass. Built exclusively for those who want to drive their cars in safety and who like others to exercise similar precaution as a guaranty against accidents.

*Showing Cleaner attached by drilling directly through Glass*

## Once Cleaned—Stays Cleaned

The Presto-Felt Cleaner is made with chemically treated felt pads which wipe the surface entirely clean, causing the rain to "flatten" out as it hits the glass, leaving a clean, "flat" surface through which the driver gets a clear view of the road ahead. No "beads" of rain to obstruct the view. Presto-Felt entirely eliminates that blindfolded effect. One cleaning sufficient in any storm.



*Cleaner attached through rim of windshield.*

## Fits Tight—Can't Rattle

Holders are made of high quality, oil-tempered spring steel, insuring positive pressure which thoroughly cleans and a uniform tension which prevents cleaner from rattling or dropping down in line of vision. The double felt pads keep both sides of glass thoroughly cleaned.

*Simple in construction; extremely efficient in operation.*

**PRICE $2.00** Complete With All the Necessary Attachments

At your dealer's or sent direct on receipt of price and your dealer's name.

**Dealers Wanted Everywhere**

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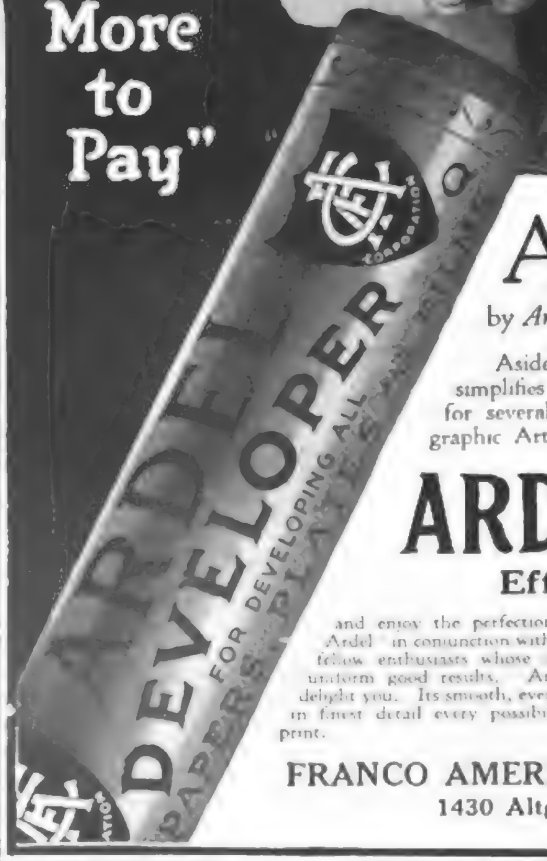
# A Safe Developer *for* Papers, Plates *and* Films

"The Safety Way and No More to Pay"




ASK for Ardel Developer—the long-lasting, non-poisonous developer, created by famous *French* experts of photographic chemistry and perfected by *Americans* to a basis of economical commercial utility.

Aside from its non-poisonous feature, this wonderful developer simplifies the mechanical process of developing to such an extent that for several years it has been a favorite of the professional Photographic Artist. Ask for

## ARDEL DEVELOPER

**Efficient, Safe, Economical**

and enjoy the perfection and the safety of Ardel in conjunction with your more advanced fellow enthusiasts whose living depends upon uniform good results. Ardel will surprise and delight you. Its smooth, even operation brings out in finest detail every possibility of a negative or print.

**To Obtain Ardel**

Both professionals and amateurs—inquire for Ardel from your usual source of photographic supplies. If not immediately available, send 10 cents for a tube to cover postage and send name of your dealer or jobber.

FRANCO AMERICAN CHEMICAL CORPORATION
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*We back this Trade-Mark with our Reputation.*

DAVIS MADE — THE DAVIS SEWING MACHINE CO. DAYTON, OHIO

# What One Father Learned *Last* Christmas

"Do you know—you fathers and mothers—actually HOW much that boy of yours *wants* a bicycle? Let me tell you.

"I'm a father—and MY boy wanted a bicycle. But like many fathers, I kept putting him off from Christmas to Christmas.

"Finally, LAST Christmas I bought him a bicycle—and I wish you could have seen that youngster Christmas morning.

"There in the middle of the room stood his new *Dayton* bike—bright and shining. And so were his eyes.

"He walked around it—studying its delights from every angle—and finding new ones at every step. And forgetful of everything and everybody—lost in his delight—I heard him saying to himself—over and over:

" 'It's almost too good to be true—too good to be true. And I won't have to borrow rides on Jimmy's bike any more—or get off whenever he tells me to!'

"I thought I knew how much a boy wanted a bicycle—but I NEVER knew until that Christmas morning. And my joy was tempered only by the soul-felt wish that I had REALIZED the tuggings that besiege a boy's heart—and made him THAT happy before."

A *Dayton Bicycle* will make YOUR boy—or anybody—happy THIS Christmas—and YOU, too! See the Dayton dealer in your community—or write us for Catalog 45.

Cycle Dept., THE DAVIS SEWING MACHINE CO., Dayton, Ohio

# Dayton Bicycles

*Please Mention Popular Mechanics*

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# The Heart of the Wireless

***An Amateur Station Without a Vacuum Tube is Years Behind the Times***

# Marconi V. T.

## $7.00 each

Under agreements recently effected the Marconi V. T. is the only vacuum tube, or audion, which may be sold to amateurs, laboratories, schools of instruction and experimenters.

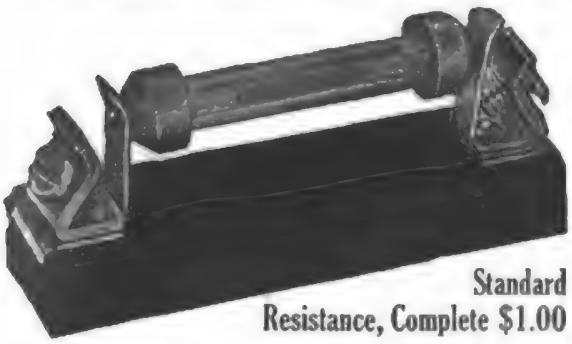
**The approximate operating life of the MARCONI V. T. is 1,500 hours**

**Standardized Socket $1.50 Additional**

Class I—Designed for use as a detector; operates with plate potential of 20 to 60 volts.

Class II—Designed for use as an amplifier; plate potentials from 60 to 110 volts may be applied.

Tubes in either class may be used for detection or amplification, but those of Class I are best as detectors, and Class II tubes are superior as amplifiers.



Standard Resistance, Complete $1.00

The Marconi Resistance, connected in the circuit between the grid and the filament of the Marconi V. T., is made in the following standard sizes:

½ megohm, 1 megohm, 2 megohms, 4 megohms, 6 megohms.

Resistances of any special fractional values up to 6 megohms can be supplied.

***Send all remittances with order to COMMERCIAL DEPARTMENT***

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# Strength is the dominant feature of ~ DURACORD

TRADE-MARK

*This is Duracord. Thick, heavy strands, woven like a piece of fire hose, not braided. Picture shows outside covering only with impregnating compound removed.*

DON'T believe that Duracord is the best portable electric cord made until you prove it to yourself. Send for samples of Duracord and the ordinary braided cord. Test them any way you please. Show them to your electrician or superintendent. You will readily see the superiority of Duracord.

For any portable electric cord that is subjected to hard service and abuse, mechanical strength is absolutely essential. You get this strength in Duracord—because it has a special covering of fine quality cotton *woven* like fire hose—*not braided*. This weave gives the covering a wear resisting quality without which the best of copper and insulation are wasted.

*Ask your electrical jobber about Duracord or write us.*



*Here is the ordinary braided cable covering. Note the open and porous construction, easily cut, stretched or unraveled. Compare it with the illustration of Duracord above.*

## TUBULAR WOVEN FABRIC COMPANY

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*Makers of Duraduct, Flexible Non-Metallic Conduit*

*Please Mention Popular Mechanics*

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# Let Our Graduates Repair Your Autos Trucks and Tractors

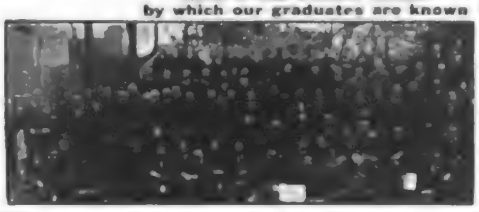
# THEY ARE TRAINED IN DETROIT -The Auto Center-In The Factory-Endorsed School

Michigan State Auto School students are trained as the auto manufacturers and their service managers want them trained. The auto manufacturers and service managers have assisted us in every way in outlining our course. They work with us continually and furnish us their latest equipment in order that we may turn out thoroughly competent-trained men. **They heartily endorse the M. S. A. S.**

## 8,000 Graduates Trained to Help You

Factories, service stations and garages throughout the country are calling for Michigan State Auto School trained men. Dozens of requests come to us daily. Why? Because the men we turn out are trained along practical lines. They are far ahead of the fellows who have just knocked around garages and factories picking up what little knowledge they could. Our students are thoroughly **trained from the ground up by factory-endorsed methods.** They are given theory as well as practice:—trained in both head and hand,—trained to **think** and **do.** The factories will tell you that our students must pass very rigid examinations before they can obtain diplomas. Our graduates make good and are successful because our Course teaches them how to locate trouble quickly and correct it successfully.

**Here is the TRADE MARK by which our graduates are known**



**—and here is one group of our students training to serve you**

## These Men Are Trained to Give Practical Auto Service!

Throughout our entire course of instruction thoroughness, accuracy, fair treatment and application are made the cardinal principles. This careful training greatly benefits the student, the car owner and the industry generally.

### Our Graduates Can Help You

Next time you need repair work for your auto, truck or tractor, let an M. S. A. S. graduate know that he can do the work as it should be done. If you don't know where to find one, fill out and send us the Coupon below and we will gladly send you a list of them in your vicinity.

### Notice to Our Graduates

Every graduate of the Michigan State Auto School, no matter whether in business or holding a good position, is requested to write us at once, giving his name and present business address so that we can place it on the M. S. A. S. Roll Book of Trained Automobile Men.

***It Pays to Let an M. S. A. S. Graduate Do Your Auto Repair Work***

# MICHIGAN STATE AUTO SCHOOL

*"The Detroit Auto School"* ——— *"In the Heart of the Auto Industry"*

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**Sign and Mail This Coupon**

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GENTLEMEN:—Please tell me where I can get ... one of your graduates to do expert repair work on my ...

NAME _____

STREET _____

CITY _____ STATE _____

NUMBER OF CARS? _____ TRUCKS? _____ TRACTORS? _____

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GENTLEMEN:—Please send me your Free Catalog, and information on Course checked below.

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"THE crank handle kicked back and struck my arm a hard blow. I was badly bruised, but Sloan's Liniment soon relieved the ache and pain!"

For the stiffness of long-continued hours at the wheel, "auto leg," and the general soreness attendant upon hard driving, Sloan's Liniment is wonderfully effective in producing prompt, thorough relief.

A counter-irritant, it soon scatters the congestion and *penetrates without rubbing* to the afflicted part. Brings a comforting tingle of warm relief from all external aches and pains—Rheumatic Twinges, Sciatica, Lumbago, Neuralgia.

Every autoist should keep it handy. Three sizes—35c, 70c, $1.40.
At all druggists.

Sloan's Liniment The World's

KEEP IT HANDY




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# Save

## TIRES LIKE THESE

## I Earned $2200 IN Four Months

### This is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Surgery Business. In a few weeks he had purchased and installed a Haywood outfit. A short time afterward he wrote us that his income in four months was as much as it had been in Two and One-Half years as Telegraph Operator.

## Earns $800 Month

### This is E. T. Buchmann

He is a Tire Surgeon at 4903 N. Clark St., Chicago. He says: "Am earning $800.00 per month, and confining myself solely to rebuilding of Tires by Haywood Method."

## Be a TIRE SURGEON

### Make $2,500 to $4,000 Per Year Giving New Life to Old Tires.

It is being done—by the wonderful new Haywood Method of Tire Surgery. It is one of the great results of the war. A Haywood Tire Surgeon can do more with old tires than was even dreamed of before the war. By the Haywood Method a Haywood Tire Surgeon can give 4,000 to 5,000 more miles of new life to a tire, that two years ago would have been thrown on the junk pile. As a surgeon saves human lives by his operations, so by **Haywood Tire Surgery**, you can save and lengthen the life of old tires. And it's easy to learn.

## HAYWOOD'S TIRE SURGERY

### Stations Are Needed Everywhere

**20,000,000 tires wearing down every day.** By Tire Surgery, you can quickly repair, rebuild and give new life to tires seemingly all worn out. Cuts, gashes, tears, bruises, broken fabric, every kind of an accident that can happen to **any** tire, inside or out, you can repair and save for long service. The chance to make money is simply wonderful.

WITH THIS HAYWOOD OUTFIT

## $2,500 to $4,000 A YEAR Is Possible

During the war the nation needed an unusual service to keep the thousands of automobiles, ambulances and aeroplanes going day and night. HAYWOOD TIRE SURGERY met the demand.

If you could see all the truth you wouldn't believe it. You would say, "It is too good to be true". But you can see what a great field there is for **Haywood Tire Surgery Stations** — for this business way. You have eyes. You see why there must be wonderful chances to make money. But [illegible] **is not enough. It is action—decision** that counts these days. The man who waits, gets lost in the shuffle. **It is the resolute will to follow your hunch that lands** you where the money is.

## WRITE TODAY

M. HAYWOOD, President
Haywood Tire & Equipment Co.
649 Capitol Ave., Indianapolis, Ind.

DEAR SIR. Please send me by return mail your free book on the new Haywood Tire Surgery Method and full details of your free school of tire repairing.

Name .....

Address .....

.....

## Send Today For My Free Book

I have ready to mail you the day I get your request, a fascinating book—all about tires—how to [illegible] by the Haywood Method—how to start in business—how to [illegible]—what to charge. You needn't write a letter; just fill in and mail the coupon right now. In 48 to 72 hours you can have [illegible] in front of you. It's a case of walking right into [illegible] a year and up. Use coupon at the left.

**M. HAYWOOD, Pres.**
**Haywood Tire & Equipment Co.**
649 Capitol Avenue Indianapolis, Indiana


*Please Mention Popular Mechanics*

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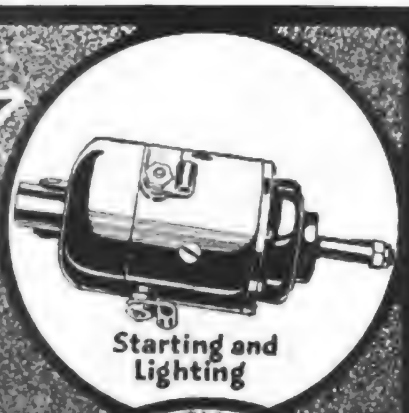
# Repair Any Auto or Auto Truck

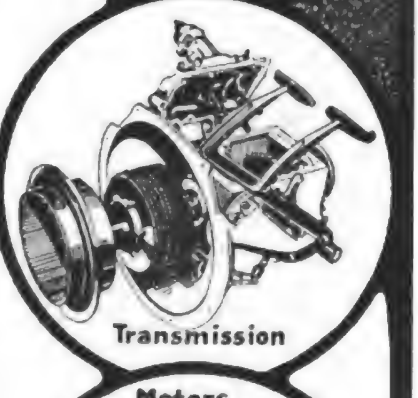
## Examine These NEW AUTO BOOKS FREE



Be an expert auto repair man. You can have the skill that makes every complicated trouble as easy to fix as taking out a spark plug. Learn every detail of all makes of cars and trucks. Know exactly how to find what's wrong and how to make all repairs quickly. These great new Auto Books show you how.

## Make Money Repairing Autos

The limited output of new cars in 1918 did not anywhere near meet the demand. Rebuilt cars are selling at a premium. Never before have expert auto repair men been in such great demand and made so much money. Now is your great money-earning opportunity in the auto repair business. Every mechanic, every chauffeur, every car owner needs this great **New Library of Automobile Engineering.**



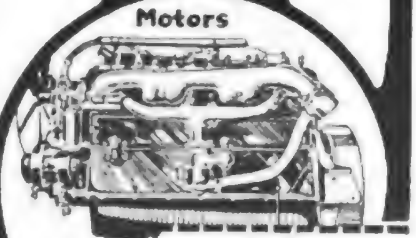

**Tells About**

**Explosion Motors, Welding, Motor Construction and Repair, Carburetors and Settings, Valves, Cooling, Lubrication, Fly-Wheels, Clutch, Transmission, Final Drive, Steering, Frames, Tires, Vulcanizing, Ignition, Starting and Lighting Systems, Shop Kinks, Public Garage Design, Equipment and Operation, Electrics, Storage Batteries—Care and Repair, Steam Cars, Motorcycles, Commercial Trucks, Glossary. More than 100 blue prints of Wiring Diagrams.**

## 50c a Week

### If You Decide to Buy

Let us send you the complete six-volume set of Automobile Engineering for one week's examination. Read the simple directions for repairing every automobile trouble. Six thick volumes, 5½ x 8¾ inches, flexibly bound in American morocco. 2,050 pages, 2,100 illustrations, wiring diagrams, etc. Everything in plain, every-day language, simple to understand. If you decide to keep them, send only $2 in seven days, and $2 a month thereafter until the special introductory price of $19.80 has been paid. The regular price is $30.00, so you save $10.20 by acting at once.



## Send No Money

Don't send a penny! Your name and address in the coupon brings the six books to you at once for seven days' trial. With each set we give you absolutely free a $12 Consulting Membership, entitling you to ask our staff of automobile experts as many questions as you wish, a whole year free.

*Mail Coupon NOW*

**American Technical Society**
**Dept. AA-199, Chicago, U. S. A.**

**AMERICAN TECHNICAL SOCIETY**
**Dept. AA-199, CHICAGO, U. S. A.**

Please send me the six volume set of Automobile Engineering for seven days' examination, shipping charges collect. If I decide to buy I will send $2.00 within seven days and balance at $2.00 a month until $19.80 has been paid. Then you will send me a receipt showing that the set of books and the Consulting Membership are mine and fully paid for. If I think I can get along without the books I will return them, after 7 days, at your expense.

Name .....

Address .....

Reference .....

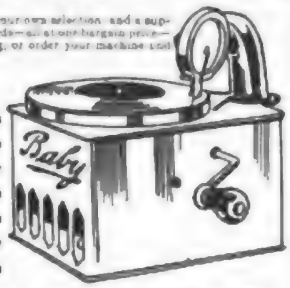
*Please fill out all lines*

# TALKING MACHINE Complete Outfit $5.98

**With Three Double Face Emerson Records and Package of Needles**

A real talking machine, not a toy. Plays real disc records just like expensive machines. It is constructed heavily of steel, with a wonderfully easy running motor. You'll like its clear, loud tone, particularly bringing out as it does, the full charm of the music or voice. It can be adjusted to play fast or slow, soft or loud, as you prefer, but, above all it has been so strongly constructed that it will stand lots of rough handling. A fine machine for indoors or to take with you outdoors, camping, canoeing, dancing—wherever you need music.

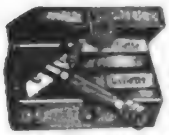
We include FREE, three double faced records, your own selection, and a supply of needles. You get the machine, needles and records—all at one bargain price—$5.98. In ordering, select records from the following, or order your machine and select your records after complete list reaches you.




## Select Your Records

| | | |
|---|---|---|
| Can Anyone Blowing Bubbles | | 7455 |
| Dear Old Pal of Mine—Solo<br>Some Day I'll Make You Glad—Solo | | 7460 |
| If It Comes from Dixieland<br>Kiss of My Heart—Two Solo | | 7467 |
| Trixie Glide—One Step<br>Some One Step—One Step | Band<br>Band | 7473 |
| How To Gossip Keep 'Em—One Step<br>What's That—Fox Trot | Band<br>Band | 7481 |
| How You Gotta Wet Your Whistle?<br>St. Louis Blues—Characteristic Song | | 7417 |
| In the Land of Beginning Again<br>Oh, Promise Me | | 7444 |

# GENUINE GILLETTE $4.59



The story is all in the headlines—this is a standard $5.00 razor, silver plated—with 24 Gillette Blades—the best money can buy. Order it either in leather case, or vest pocket pattern at this very special price of $4.59.

## Gillette Blades

These are standard Gillette blades—40c in 1 dozen pack—89c in dozen pack.

# MUSCLE BUILDERS $1.49

Attach these pairs to your wall and use them regularly. Watch your muscles grow. These splendid exercisers for developing muscles have extra coil springs, with Japanned handles, cut to fit the hands. They can be adjusted readily to the floor or wall, at all angles, and will be of enormous value in developing the muscles of the chest, back and arms.

# Men's Raincoat

**Guaranteed Rainproof**

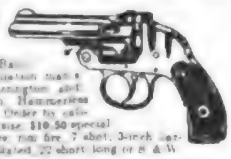
**$7.49**

This is a sporty looking substantial raincoat at a price so reasonable as to mean a real bargain for rain getting wet, by going without one. It comes in a smug fitting model, becoming for young and old, with big patch pockets, adjustable military collar and a belt at the waist. Made of rubberized fabric in olive drab color. An unusual value.

## Automatic Cigarette Case, 25c

Hands them out one at a time. The slickest thing you ever saw. Case is nickel-plated, in fancy design, strongly built to last you for years. Men find it most convenient style of cigarette case. Keeps cigarettes in good condition.

## HAMMERLESS REVOLVER $10.50



Just a "Ba... but a reputation that's sure. Hammerless and Richardson. Hammerless Revolver. Order by calibre, rather size. $10.50 special.

22 calibre rim fire 7 shot, 3-inch barrel nickel-plated .22 short long or S & W cartridge.

32 calibre centre fire 5 shot 3-inch barrel, nickel-plated .32 S & W cartridge.

38 calibre centre fire 5 shot 3½-inch barrel, nickel-plated 38 S & W cartridge.

## 50 Shooter Automatic CAP PISTOL

**And Box of Ammunition**

Bangs with 50 deafening reports, one after another as quick as you can pull the trigger. REPEATING CAPS, to fit this pistol come in rolls of 50 shots each; at 5c a box. Pistol alone without ammunition, 25c.

## SOAK 'EM WATER PISTOL 25c

Looks like a genuine automatic, made of steel, with an ejector built to get out of order. Because of the powerful air pressure of the cylinder it will squirt a large stream of water to a great distance. Can be carried in the pocket and used without any other fellow's not knowing. Great for fun on a picnic.

# Handy Man Combination Pen Knife $1.69

Knife, screw driver, bottle and can opener—all in one. The handiest pocket knife a man ever had. Ideal for camping outing and every-day convenience. Made of finely tempered steel, brass lined and contains one large blade, screw driver, bottle opener and can opener. Has a ring handle, with ring for attaching to your chain.

## Jack Knife, 69c

An inexpensive sturdy knife built to stand constant use. Has handle, one large and one small blade, both made from the best Wardlow English steel, with keen edges. It is lined with brass, and has nickel silver bolsters. A splendid knife at our special bargain price of 69c.

## Wrenches 10 In 1

These wrenches come with five nickel plated end wrenches that, with the aid of the thumb bolt in the centre will fit ten nuts. You'll find them compact and convenient, ready for any job when you want them. 89c Per Set.

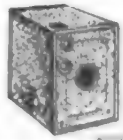
## STURDY ELECTRIC MOTOR 99c

You'll find this a strong, sturdy, two terminal electric motor, just the thing for operating light running models and electric toys. Can be run with one or more dry or wet cell batteries, depending upon the power desired.

## Novelty Knife and Bottle Opener 98c

This knife is bound to appeal to the men. The handle is in the shape of a leg with the shoe end forming a bottle opener. The two fine steel blades open easily, and fit back in the handle when not in use.

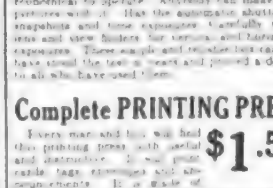
## Genuine CAMERA EASTMAN BROWNIE $2.86



Makes pictures 1¼x2¼. Is a genuine reliable efficient and economical to operate. Anybody can make good pictures with it. Has the automatic shutter for snapshots and time exposures. Carefully tested lens and view finders for vertical and horizontal exposures. These simple and reliable box cameras have stood the test of years and proved a delight to all who have used them.

## Complete PRINTING PRESS $1.50

Every man and boy will find this printing outfit useful and instructive. It has press, cards, tags, envelopes and advertisements. It is made of ... rubber type cards ... and contains a ... of instruction ... press and ... which can be ... easily operate ...



# HUNTING KNIFE 60c

A great knife for hunting, camping, fishing and all sorts of outdoor work. It comes with a 4-inch heavy steel blade, finely tempered, with aluminum handle, fitted to your grasp. Every knife comes in a genuine leather sheath, with slits in the end through which to slip your belt.

# Luminous WATCH $2.75

**Shines in the Dark**

The only cheap thing about this watch is the price, for you'll find it the all-around handiest timekeeper imaginable. It has the luminous dial that makes it easy to see the time, no matter how dark the night, and a nickel-plated case that will stand the hardest sort of usage. It is fully guaranteed, of course.

## Pocket Flashlight 39c

**Very Special**

A flashlight that fits in your vest pocket, all ready for service, when you need a good clear light. Comes with nickel plated case, equipped with a very bright bulb and a 2-cell battery. The price of 39c is a very special one—for this occasion.

## GIANT RAY FLASHLIGHT

**Very Powerful**

This is a genuine Tungsten flashlight, five inches long, with a powerful light in a light-weight, vulcanized fibre case. It flashes on with a pressure of the button and will stay lighted by using the slide switch with which it is equipped. Carefully packed, complete for 99c.

# LEARN A TRADE

**With the Help of one of these Books**

**$1.00**

Modern Electric Illumination.
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## Special Fountain Pen Offer

Full size, 61-2 inches long. Lever self-filler. Guaranteed non-leakable. Your name inlaid in gold FREE. 14-k solid gold pen, iridium tip. We guarantee free repairs for 2 years. Our special factory price to you, only $1.00. Simply pin a $1.00 bill to the coupon and send for this great fountain pen value TODAY.

**$1**

TODAY, more than ever, you should be sure to get the great money-saving 1920 Basch De Luxe Diamond Book before you think of buying a diamond. The coupon brings it to you *free*. See the truly wonderful bargains which are offered through the great buying power, expert knowledge and foresight of the great House of Basch. In spite of rising prices, in spite of the scarcity of Diamonds, Basch still offers a blue white ½ carat at $48.75; ¾ carat at $72.00 and many other equally attractive bargains. But you must get our book quickly, while these remarkable offers last. Don't delay. Send the coupon *today*. Act NOW!

## Money Back Guarantee

Basch guarantees in writing to refund full cash price less 10% should you, for any reason, wish to return any diamond bought from us within a year. Also offers you full price in exchange for another diamond at any time. Carat weight, quality and value is guaranteed. "See that your diamond is Basch guaranteed."

## Free Examination

Basch takes all the risk. Diamonds sent for free examination. You pay nothing until you have examined and proved to yourself that the diamond you ordered is a real bargain. Don't miss this wonderful opportunity. Act now.

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**L. BASCH & CO.** Dept. 03471 — State & Quincy Sts., Chicago

### Free Coupon

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Dept. 03471 — Chicago, Ill.

Please mail me *free*, without obligation, your 1920 Basch De Luxe Diamond Book.

☐ I am enclosing $1.00. Please send me your guaranteed fountain pen with my name, as printed below, engraved in gold, free.

*Name* _____

*Address* _____

*Town* _____ *State* _____

*Please Mention Popular Mechanics*

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# This kind of Mince Pie

Was it because you were so hungry?—was it because mother put so many good things into it?—or was it just because you were so young, that mother's mince pie tasted so good?

In order to help you make up your mind, take home tonight a package of

# NONE SUCH MINCE MEAT

This mince meat has all the good things in it that mother used to blend in her mince meat. It's to be had in a neat little package all ready to mix for the pie crust. And it can be made right up into a

**MINCE PIE**

***"Like Mother Used to Make"***

Do you remember what an appetite you had for Mince Pie Day in your mother's time? Mince Pie Day can be today, if you take home a package of None Such.

**Merrell-Soule Company,** Syracuse, N. Y.

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## WITH SAFETY

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A request for E12 will bring descriptive circulars and a list of other securities.

Denominations, $100, $500, $1000

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Containing complete story of the origin and history of that wonderful instrument—the

**SAXOPHONE**

Easy to Play
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This book tells you when to use Saxophone—singly, in quartettes, in sextettes, or in regular band; how to transpose from orchestral parts and many other things you would like to know.

You can learn to play the scale in one hour's practice, and soon be playing popular airs. You can double your income, your pleasure, and your popularity. Easy to pay by our easy payment plan.

**MAKES AN IDEAL PRESENT**

Send for free Saxophone book and catalog of True-Tone Band Instruments.

**BUESCHER** BAND INSTRUMENT CO.
270 Jackson Street, Elkhart, Ind.

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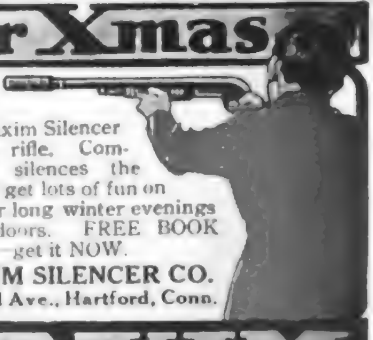
**for Xmas**



—a Maxim Silencer for his rifle. Completely silences the noise. He can get lots of fun on stormy days or long winter evenings practicing indoors. FREE BOOK explains fully—get it NOW.

THE MAXIM SILENCER CO.
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# The Day After Christmas

One gift stands out above all others—the one you use at once for good, hard play.

## The Auto-Wheel

Jump on it on Christmas morning, and you'll know it's Christmas. And the next day, and on through boyhood Auto-Wheel is your most dependable friend. Always ready for fun or work. It coasts faster than others, and is easier to pull with a load.

Has real roller bearings, and the steel tires and axles make it strong and long-wearing.

### Two Types

There's the **Auto-Wheel Coaster**—the old reliable—a marvel for coasting and general use. And there's the **Auto-Wheel Convertible Roadster**—two wagons in one. One minute a box-wagon, the next the snappiest roadster you ever saw.

Put the Auto-Wheel on your Christmas list. The other fellows want it, too. Form your Auto-Wheel Coaster Club when you get your wagons. We'll send a cap for each member, and a special cap for the Captain.

FELT PENNANT FREE—Also Auto-Wheel Booklet. Just send us names of 3 local coaster dealers, telling which one handles Auto-Wheel.

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# ASBESTOS

We are miners and shippers of Crude Asbestos in any quantity. We produce all grades at our world-famous BELL ASBESTOS MINES, in Canada. We also card fibres, spin yarns, weave cloths, and make all sorts of Asbestos products.

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**Owners of the world's largest Asbestos Mines**

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***Freight prepaid*** on any **"RANGER"** bicycle. **Write at once** for our *big catalog* and *special offers*. Take your choice from 44 styles, colors and sizes in the famous **"RANGER"** line. *You cannot afford to buy* without getting our *latest propositions* and **Factory-to-Rider** prices.

**Easy Payments** if desired, at a small advance over our special **Factory-to-Rider** cash prices.

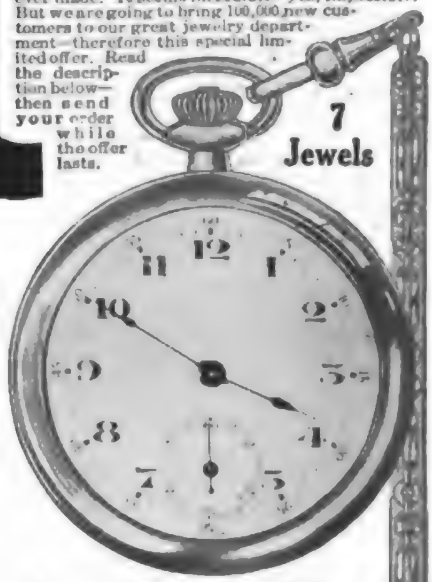
**Boys**, be a **"Rider Agent"** and make big money taking orders for bicycles and supplies.

**TIRES** equipment, sundries and everything in the bicycle line at *half usual prices*. *Write today*. A post card will do.

**MEAD CYCLE COMPANY Dept. T108 Chicago**

# $1 Brings This High Grade Watch, Chain and Knife

Here is one of the most sensational watch offers ever made. It seems incredible—yes, impossible. But we are going to bring 100,000 new customers to our great jewelry department—therefore this special limited offer. Read the description below—then send your order while the offer lasts.




Cut Shows Actual Size

## Handsome Gold Filled Case

***Guaranteed 10 Years***

This watch is a splendid time-piece. Specially selected by our watch expert as equal in appearance to many for which you would pay much more. Case is gold filled and made in the popular plain finish, highly polished—the product of one of the world's most famous watch case makers. Absolutely guaranteed for 10 years. Imported (Swiss) movement with 7 jewels and 2adjustments. Dial with Arabic numerals. Looks exactly like a fifty dollar watch and is a remarkably accurate timekeeper. You must see this watch outfit to realize what a big bargain it is—and you get it at our bargain price and easy terms if you act now. Read our sent-on-approval offer below.

## Gold Filled Chain and Knife

And here is something extra. We send with the watch (and make no extra charge) this handsome 10 year guaranteed gold filled chain, and beautiful 10 year guaranteed gold filled knife. Chain has alternating oblong and circular links. Knife has two finely tempered steel blades and 10 year guaranteed gold filled handle, richly embossed on one side, highly polished on the other. A superb outfit, all complete, packed in handsome lined case.

**Send Coupon or Letter** Only $1.00 now and we ship all 3 articles—the watch, the chain and the knife. When they arrive, examine them carefully. Then if satisfied that they are a wonderful bargain and what you want, pay for them on our easy monthly terms. **Order by No. 450BMA44. Price $19.98. $1 with order. Balance $2 every 30 days until price is paid.**

**FREE Jewelry Catalog** Whether you order the watch, chain and knife or not be sure to get this book. Filled with bargains in watches, rings, brooches, La Vallieres, chains, cuff links, toilet sets, silverware, etc. The very choicest, most artistic designs at prices which mean money saving for you. Only a post card necessary. Just tell us to send the Hartman Jewelry Catalog and it goes by return mail—free. Send for it.

**Hartman Co. (Jewelry Dept)**
**3945 LaSalle St., Dept. 2341 Chicago**

Send the watch, chain and knife No. 450BMA44. I enclose $1 and if satisfied will pay $2 thirty days after arrival and $2 monthly thereafter until the price, $19.98, is paid. Otherwise will return the articles and you will refund the $1 and return postage.

Name .....

Address .....

City ..... State .....

*Please Mention Popular Mechanics*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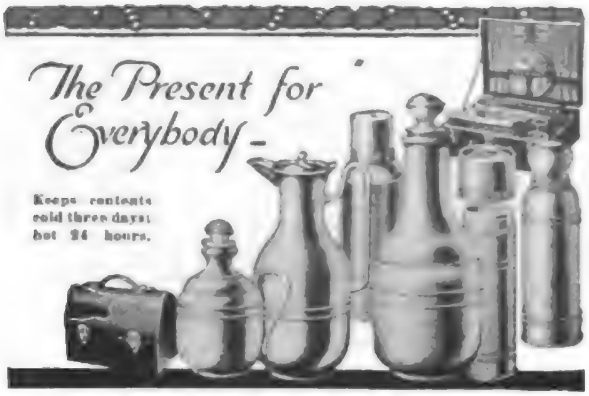


GIVE AN
# ICY-HOT
for CHRISTMAS

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Everyone who loves life in the outdoors, who motors, travels, fishes, or hunts—finds the hot or icy cold drinks and food he can carry in his Icy-Hots delightful.

In the home Icy-Hot keeps babies' milk or invalids' broths at proper temperature, always ready for instant serving. Icy-Hot Lunch Kits are needed by all who carry lunch.

Easily cleaned—absolutely sanitary. Protected against breakage—last a lifetime. Look for name "ICY-HOT" on bottom. Ask your dealer. If he can't supply you, send his name.

*Write today for Illustrated Catalog.*

**THE ICY-HOT BOTTLE COMPANY**
218 West Second Street Cincinnati, Ohio

## Save All Scrap Lead

Use all scrap lead, shavings and trimmings, by melting down into usable form in this

AMBU LEAD MOLD

Every metal shop needs them. Pays for itself in salvage in a few weeks. $1.50 Each. $2.50 Pair. Write for circular C—of other battery shop money savers.

American Bureau of Engineering
601-1601 S. Michigan Ave., Chicago

Quality First
# Boston Garter
*Velvet Grip*

*Please Mention Popular Mechanics*

*Here, Bill*
*- a Luden's will fix that throat*

A clear nose and throat will make working easier. Workers in all industries use Luden's the year 'round. A protection in damp or dust.

**LUDEN'S** MENTHOL COUGH DROPS
GIVE QUICK RELIEF

## Blue Buckle OverAlls

Union Made

"Strong for Work"

Jobbers OverAll Company, Inc. Lynchburg, Va.

The choice of American workmen for nearly half a century—because THEY *WEAR LONGEST*—
**SWEET-ORR**
**CLOTHES TO WORK IN**

# AGENTS: $12.00 a Day

## 2 in 1 Reversible Raincoat

Something new. Not sold in stores. Positively guaranteed waterproof. Steam vulcanized. Ideal for rough work and hard service. One side a handsome black raincoat, reverse side a fine dress coat. For business men, clerks, farmers, teamsters, truck drivers. Every man a prospect. Wolf sold 19 coats in 4 days. Binford sold 26 coats in 5 days. Easy seller. Everybody satisfied.

### Big Opportunity for Women

We have all styles and sizes for men, women and children. Mrs. Jones in her spare time sold 10 coats in less than a week. Edith Remor says: "It's the easiest and best seller I ever saw. I sold 3 coats to one family yesterday." Don't delay. Act quick. Be first in your community to introduce this new reversible coat and our new line of guaranteed raincoats. Send at once for our offer and sample.

**THOMAS RAINCOAT CO.**
448 Jane St. DAYTON, OHIO


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# I Teach by Mail

I CAN make a **good penman** of you at your home during spare time, no matter where you live or how poorly you now write. My simplified system has shown thousands of **others** the way to good penmanship during the past twenty years — it **can** and **will** do the same for **YOU!**

**Beautifully Illustrated Book**

**"How to Become a Good Penman"**

**FREE!**

It contains general information, with testimonials and beautiful specimens of penmanship showing what others have accomplished by the Tamblyn System. (Your name elegantly written on a card if you enclose stamp for postage.) WRITE TODAY. Address

**F. W. TAMBLYN**

**418 Ridge Bldg., Kansas City, Mo., U. S. A.**

## WAXED CARBON PAPER

Will not smut, dry out or wrinkle; superior wearing and manifolding qualities; will not soil the hands or stationery; make clean, legible copies. Sold direct at factory prices; all colors in light, medium and standard weights. Send $1 for sample box of 50 sheets, legal size. State color and weight desired. Money back if not pleased. Address, **Dept. 19. THE RIBBON WORKS, Galveston, Texas**

*If it hasn't this Red Woven Label*

MADE FOR THE B.V.D. BEST RETAIL TRADE

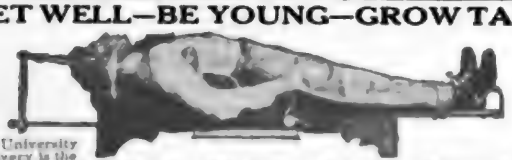
*It isn't* B.V.D. *Underwear*

## ENTER A BUSINESS

of your own and earn big annual income in professional fees, making and fitting a foot specialty to measure; readily learned by anyone at home in a few weeks; easy terms for training, openings everywhere with all the trade you can attend to. No capital required or goods to buy. No agency or soliciting. *Address*

**STEPHENSON LABORATORY, 1 Back Bay, Boston, Mass.**

## GET WELL—BE YOUNG—GROW TALL



This University discovery is the most important health invention of the century. It remakes and rejuvenates the human body. It produces normal stance. It frees impinged and irritated nerves, corrects contracted muscles, shortened ligaments, eliminates congestion, improves circulation and drainage of the body. **It will increase the body's length.**

**THE PANDICULATOR CO., 1514 Prospect Ave., Cleveland, O.**

## Amazing Profits In Mushrooms

Anybody can add $5 to $10 per week to their income, in spare time, raising your growing mushrooms in cellars, sheds, barns, boxes, etc. I tell you where to sell at highest prices.

Free Illustrated Instruction Booklet

**HIRAM BARTON**

**Dept. 2, 329 W. 48th St., New York**

# Typewriter Sensation

## Free Trial

*Use as You Pay*

ONLY

**$4.00**

**a month until the low total price of $44.35 is paid, and the machine is yours.**

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $4.00 a month and own one. Cash price, $40.75. Never before has anything like this been attempted.

## NATIONAL TYPEWRITERS

### Direct from Factory

**You will be the first one to use it. It is a personal writing machine.** Weight 9¾ pounds. Is equipped with all the latest attachments and every modern operating convenience as found on latest models large 40 and 50 pound typewriters.

The National will do all the work they will do as an office machine, and at the same time has all the advantages as a **portable** traveling typewriter.

### See and Try Before You Buy

Comes to you with everything complete: tools; light, strong carrying case; instruction book; ribbon; nothing extra to buy. You cannot imagine the perfection of this beautiful typewriter until you have seen it.

### You Take No Risk — Put in Your Order *Now*

When the typewriter arrives deposit with the express agent $8.35 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me $4.00 a month until our bargain price of $44.35 is paid. If you don't want it, return it to the express agent, receive your $8.35 and return the machine to me. I will pay the return express charges. This machine is guaranteed. It is standard.

**The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today — mail to me — the typewriter will be shipped promptly.** There is no red tape. I employ no solicitors — no collectors — no chattel mortgage. It is simply understood that I retain title to the machine until the full $44.35 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. **Do not send me one cent. Get the coupon in the mails today — sure.**

**HARRY A. SMITH, 510, 218 N. Wells St., CHICAGO**

**H. A. SMITH, 510, 218 N. Wells Street, Chicago, Ill.**

Ship me a National Typewriter F.O.B. Chicago, as described in this advertisement. I will pay you the $36.00 balance of the **special** $44.35 purchase price, at the rate of $4.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

**Name** .....

**Address** .....

.....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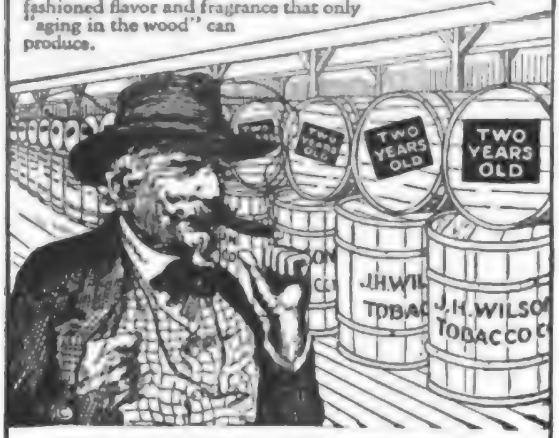
# HOME-SPUN TOBACCO

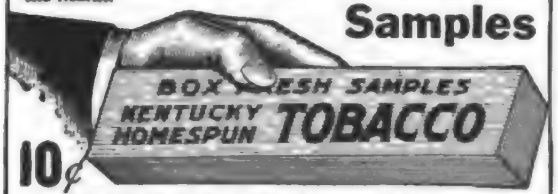
Wilson's Old Kentucky Homespun Tobacco is the cream of the finest crops Kentucky's bountiful soil can produce—ripe, rich leaves—smooth and mellow—with a rare old-fashioned flavor and fragrance that only "aging in the wood" can produce.




**From Two to Three Years My Tobacco Ages in Great Oak Hogsheads**

Aging as I do it, renders the tobacco as mellow as moonlight, as fragrant as the rose. Every trace of harshness leaves it—nothing to "bite" your tongue, or parch your mouth; nothing to tire your taste. Free from all adulterants that undermine the health.

## Samples




**Send 10c** for a box of fresh samples drawn from the original **two-year aging** hogshead. I will send you **free** a full size cigar pattern and my big new book, "The Truth About Tobacco," which tells how we Kentuckians make from the pure leaf in our own homes, the smoothest smoking—the most delightful chewing twists—the finest cigars and snuff that man ever made. Tells how to get this rich, mellow **home-spun** direct from where it is grown and

**Reduce Your Tobacco Bill 1/2**

Profusely illustrated; cover shows a typical Kentucky tobacco plantation in natural colors. Send a dime today and enjoy the cream of Kentucky's finest tobacco. State whether chewing or smoking; Strong, Medium or Mild.

**J. H. Wilson,** Expert Tobacconist Box 464, Mayfield, Kentucky

# Send only $1

*Be Your Own Dealer*

## *Secure Wholesale Rates*

**Introductory Offer** so you can try these famous goods by mail. Price $6.63 for the set. On receipt of $1 we send three splendid shirts and handsome silk neck-tie parcel post C. O. D. $5.63 and postage.

### *Six Months' Wear Guaranteed*

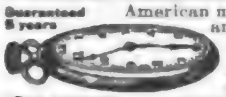
These shirts are made of finest white percale shirting fabric with neat stripes of blue, black, and lavender. One shirt of each color to the set. Cut in the popular coat style, cuffs attached, hand laundered and very fashionable. Standard sizes 14 to 17. Choose your color of tie. Money back if not pleased. Save time, order now and

## WRITE *for New Catalog* DURATEX

as good as a smart New York store, and get wholesale rates on fashionable hosiery, underwear, neckwear, soft and stiff cuff dress and sport shirts. Guaranteed for six months' wear or new garments free. You owe your pocketbook to send for it and **be your own dealer** and save dealers' profits on all you buy. It's the only real way to save.

***Wearer agents make extra money in spare time.***

**GOODELL & CO.,** 554 Duratex Bldg., NEW YORK
*Largest mail order wholesale haberdashery house in the world*




American movement, stem wind and set watch, fancy design back, wonderful timekeeper, for selling 20 large colored pictures or 20 packages post cards at 15 cents each. Order your choice.

**FREE**

SENT PREPAID. **GATES MFG. CO., DEPT. 579, CHICAGO**

**DO YOU NEED MONEY** Out of work? Got a lot of spare time? We want MEN or WOMEN in every city to do special local advertising. No experience necessary. Will not interfere with your regular work or household duties. Hundreds are now making $5 to $15 weekly. Write me for particulars. ALBERT MILLS, Mgr., 1806 American Bldg., Cincinnati, O.

## Battery Shops Need

This great salvage machine doubles the life of storage battery plates by pressing composition into grids. Make your shop more a by putting an

AMBU PLATE PRESS

Made of heavy wood, with acid-resisting finish. Nothing to corrode. Price $32.50. Write for circular B of other battery shop money-makers.

**AMERICAN BUREAU OF ENGINEERING**
**601-1601 S. Michigan Avenue, CHICAGO**

## "Best" Hand Lantern

A powerful portable lamp, giving a 300 candle power pure white light. Just what the farmer, dairyman, stockman, etc., needs. Safe—Reliable—Economical—Absolutely Rain, Storm and Bug proof. Burns either gasoline or kerosene. Light in weight. Agents wanted. Big Profits. Write for Catalog.

ADOPTED BY THE U. S. GOVERNMENT

**The Best Light Co., 324 E. 5th St., Canton, O.**

The Electric Safety razor makes shaving a pleasure. Blade vibrating 7,200 times a minute cuts the beard smoothly and without slightest pull or irritation—feels like a gentle massage. Can be used with or without electric current.

All Users of the **Lek-Tro-Shav** Speak Well of It

A barber says: "Have shaved for years and have never used any shaving device near its equal."

A home user says: "The most pleasing shave I've ever had in my life. Shaves my face closer than I used to shave, but there is no after irritation or ill effects as I usually get from another razor."

**No. 1 Made for use from Light Socket.**
**No. 2 Made for use from Dry Battery.**

Write for illustrated circular describing Lek-Tro-Shav Safety Razor fully.

AN IDEAL CHRISTMAS GIFT FOR MEN

**Vibrating Electric Razor Co., Dept. 132, Omaha, Neb.**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# Send No Money

TAILOR MADE TO YOUR ORDER ALLWORSTED

# Blue Serge Pants

$1.65

$6.50 Value

WE PAY EXPRESS

Remarkable offer. Yes, we will make you a pair to order, guarantee perfect fit and send them to you express prepaid for only $1.65. Money back if not satisfied.

**Nowhere Else** can you find such a wonderful bargain as this. We make all suits, pants and overcoats to your individual measurements. Prices guaranteed lowest ever made for Tailor Made-to-Order Suits and Overcoats.

**152 Styles** Your choice of 152 of the very latest styles. Exclusive novelty features without extra charge. Your suit tailor-made-to-order just to make others ask where you got it. **BIG PROFITS**—Make $2,500 to $3,000 a year by our wonderful new plan, fully explained in our sensational world's most beautiful Style Book with the snappy

**MOVING PICTURE TIE-UP**

Gorgeous scenes in many colors showing actual scenes of some of the snappiest moving pictures ever taken. Nothing like it. Also greatest collection of woolen samples and fashion designs ever shown. A postal brings everything free—explains all. Write quick.

**RELIABLE TAILORING CO., 377 S. Peoria St., Chicago**

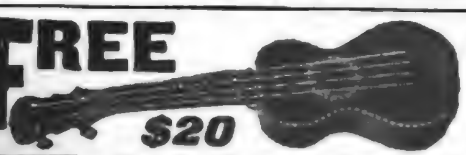
**MOVIE MACHINE FREE**

**HAVE YOUR OWN "MOVIE"**

at home. Wonderful moving picture machine, complete with gas generator and 3 sets reels, all different 96 views. Powerful lens, showing large, clear pictures. Given for selling 20 large colored pictures, or 20 packages beautiful post cards at 15 cents each. Order choice today.

**GATES MFG. CO., Dept. 879, CHICAGO**

# FREE

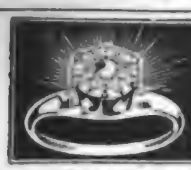


$20

**UKULELE** Hawaiian Guitar, Violin, Mandolin, Guitar, Cornet, Tenor Banjo or Banjo

Wonderful new system of teaching note music by mail. To first pupils in each locality we give a $20 superb Violin, Mandolin, Ukulele, Guitar, Hawaiian Guitar, Cornet, Tenor Banjo or Banjo absolutely free. Very small charge for lessons only. We guarantee success or no charge. Complete outfit free. Write now. No obligation.

**SLINGERLAND SCHOOL OF MUSIC, Inc., Dept. 46, CHICAGO, ILL.**



**½ Price $2.50**

**SEND NO MONEY**

**If You Can Tell it from a GENUINE DIAMOND Send it back**

To prove that our blue-white MEXICAN DIAMOND closely resembles the finest genuine South African Diamond (costing 50 times as much), with same DAZZLING RAINBOW-FIRE, (Guaranteed 20 yrs.) we will send this Ladies Solitaire Ring with one carat gem, (Catalogue price $4.98) for **Half Price to introduce, $2.50,** plus War Tax 13c. Same thing but Gents, Heavy Tooth Belcher Ring, (Catalogue price $6.26) for $3.10, plus War Tax 15c. Mountings are our finest 12 karat gold filled. Mexican Diamonds are GUARANTEED FOR 20 YEARS. **SEND NO MONEY.** Just mail postcard or this ad., state size and we will mail at once C. O. D. If not fully pleased, return in 2 days for MONEY BACK, less handling charges. Act quick; offer limited; only one to a customer. Write for FREE Catalog. AGENTS WANTED.

**MEXICAN DIAMOND IMPORTING CO.**

**Dept. ET. Las Cruces, N. Mex.**

*(Exclusive controllers Mexican Diamonds)*

# FREE course in Secret Service

MORE Finger Print Experts are needed. Men who are masters of this profession are scarce. The demand for Finger Print Experts is great. As a special inducement we will give you free of charge our new easy reading course in Secret Service Intelligence if you enroll at once.

## Be a Finger Print Expert

Build up a business on the basis of a trained brain. You can do it as a master of the Finger Print profession. There is crying need for Finger Print Experts right now and the demand for these trained men is growing every day. A profession that offers wonderful opportunities for advancement. Governments, corporations, police departments, institutions and individuals have constant use for these specially trained men. The work is fascinating and

## *The Pay Is Big!*

No special education is necessary. *You* can become a master of this profession by studying at home in your spare time. Expert Finger Print men travel all over the country solving mysteries that baffle all others. They are important men and highly regarded and envied by every one.

## Mail the Coupon

Get full information about this great profession and our big offer of a free course in Secret Service Intelligence. The mastery of these two closely allied professions places a brilliant career within your grasp. Achievements that will immediately place the stamp of success upon you, are now possible. Send this coupon for full information NOW.

**University of Applied Science**

**Desk 8199 1772 Wilson Ave., Chicago**

Gentlemen: Without any obligations whatever, send me your new FREE book on Finger Prints and your offer of a free course in Secret Service Intelligence.

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Address.....

Age.....Occupation.....

*Please Mention Popular Mechanics*


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# Save Coal With an EVINO!

—the Damper Time Check that attaches in five minutes to chains of any heating system in homes or flats.

No more fires out from forgetting to check your fire on time. No more waiting up at night to check your fires. No more overheated rooms or unnecessary waste of coal. You may forget to check your fire—**EVINO never forgets.**

No winding. No complicated parts to get out of order, the **Evino** will last for years. Saves its cost in a few months by saving coal. Fully guaranteed. Price complete, $9.00—postage or express prepaid.

*Write today for beautiful illustrated EVINO booklet.*

**The EVINO** is beautifully finished, the entire mechanism being enclosed in a compact, dullbrass case. Two small screws hold it to the wall or woodwork. If you are a renter, remove the screws and take the **Evino** with you when you move.

**EVINO MFG. CO.**
**201 Manufacturers Home Bldg.**
**Milwaukee, Wisconsin**

*(The Evino is manufactured by Mr. O. Evinrude, well-known inventor and manufacturer of detachable rowboat motors.)*

**"Every Tick Saves a Lump of Coal"**

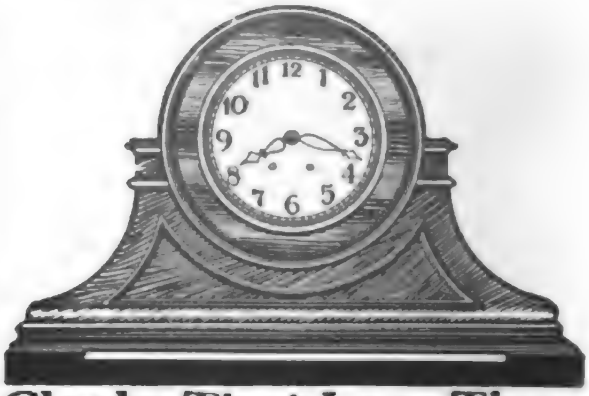
# Why use Coal or Wood?

**Turn a Valve and Cook or Heat**

**The Oliver Oil-Gas Burner** makes **any** cooking or heating stove a gas stove. Burns coal oil (kerosene). No coal or wood. Cooks and bakes better. Cheaper. Keeps your home warmer. You regulate flame. **Fits any stove anywhere.** No fire to start, no ashes, no chopping, shovelling, poking and dragging of coal. Saves hours of work and loads of dirt. Simple. Safe. Easily put in or taken out. No damage to stove. Lasts a lifetime. Thousands of delighted users. In use eight years. Money Back Guarantee. Free literature. **Agents Wanted**

**Oliver Oil-Gas Burner & Machine Co.**
1305 N. 7th St., ST. LOUIS, MO.
*Western Orders Shipped From Peoria*

**The Oliver Oil-Gas Burner makes 2 gals. oil equal 97 lbs. coal**



# Clocks That Lose Time

**can often be "repaired" by simply oiling with 3-in-One. Try this before calling on the repair man—you may save money. Clock manufacturers and jewelers recommend and use**

# 3-in-One Oil

because it never gums or collects dirt in the delicate mechanism. To oil a clock, remove the works and touch all working parts with a clean broomstraw or feather dipped in 3-in-One. Don't forget to clean and polish the wooden case or ornamental base with a little 3-in-One on a soft cloth. Rub with the grain of the wood; this brings out its natural beauty. 3-in-One is an ideal and time tested lubricant for all delicate mechanisms. It is light enough to flow to the bottom of the deepest bearings, yet has "body" enough to stay in the mechanism and wear long. Try it for sewing machines, guns, automatic tools, bicycles, typewriters, adding machines, cash registers, locks, cream separators, magnetos and Ford commutators.

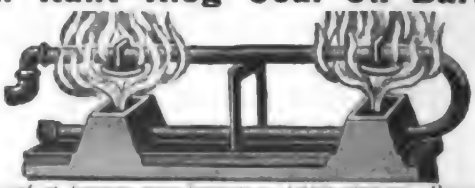
Sold at all good stores in 60c, 30c and 15c bottles; also in 30c Handy Oil Cans.

**FREE** A liberal sample of 3-in-One and Dictionary of Uses FREE on request.

**THREE-IN-ONE OIL CO.** 165 CNH, Broadway NEW YORK

# AGENTS: $12 a Day

**New Kant-Klog Coal Oil Burner**



Most perfect burner ever invented. Can't clog up. Burns 85% air and 15% gas. Turns any coal or wood stove into a gas stove. Pays for itself in a short time. Cheaper than coal. Big seller. Popular price. Write for Agency and territory.

**PARKER MFG. CO., 278 Coal St., Dayton, Ohio**

# STOP LEAKS

and save your Dollars with a 25c can of

**SMOOTH-ON Iron Cement No. 1**

Makes permanent Household and Garage repairs. Easy to apply as putty—lasting as iron. 25c and 50c per can. Write for interesting Booklet on Household Repairs.

**25c** At Hardware Stores

**SMOOTH-ON MFG. CO.**
**Jersey City, N. J., U.S.A.**

**SMOOTH-ON HOUSEHOLD CEMENT**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**$1679 BUYS THE MATERIAL TO BUILD THIS HOME**

**Improved Sensibly. Cut-to-Fit. Approved by Carpenters. When You Build "THE HARRIS WAY"** you build to stay. Exclusive cutting and bundling features—special advantages for the careful Home Builder. It is the best, safest and most sensible way to build your ideal home **right, without the waste of a single penny.**

**LOW PRICE STILL IN FORCE**

If you are needing a house, either for investment or for a home, write us.

**$10,000 FREE Plan Book**

Write today for our beautiful $10,000 HARRIS HOME PLAN BOOK now ready. 100 Designs, with floor plans, prices, etc.; explains how we save 25 to 33 1-3 % on finished cost.

*Get our FREE Blue Print Plan offer*

**Write Today**

*Your protection —Every sale iron clad guaranteed*

**Harris Bros. Co.** Dept. CX-7, Chicago

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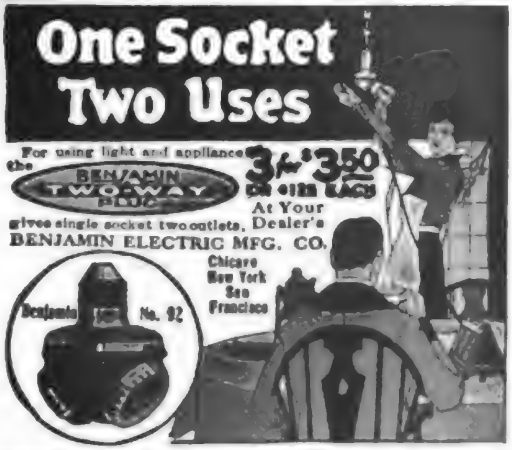
# One Socket Two Uses



For using light and appliance the BENJAMIN TWOWAY PLUG 3 for $3.50 or $1.25 EACH At Your Dealer's gives single socket two outlets.

BENJAMIN ELECTRIC MFG. CO.

Chicago New York San Francisco

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# YOU Try this Range at Our Risk

**OVER 100,000 IN USE.**

All sold on **30 Days' Free Trial. Freight prepaid.** Demand growing amazingly. Housewives delighted with results. **A GREAT FUEL SAVER. Wonderful Baker.** Many exclusive features—**Odor Hood,** carries all steam and cooking odors direct to chimney. **Ash Sifter**—permits sifting ashes right in range. No dust. **Stone Oven Bottom** absorbs and holds heat in oven; more even and thorough baking; a fuel saver. **GUARANTEED.** Lasts for years. You can buy this wonderful range at **wholesale prices direct from factory**—our only selling plan. **New 1920 design** has white enamel front, 100 styles to select from. **Easy credit terms if desired. Write today for big free catalogue.**

**THE IMPERIAL STEEL RANGE COMPANY**
**469 Detroit Avenue Cleveland, Ohio**

*Please Mention Popular Mechanics*

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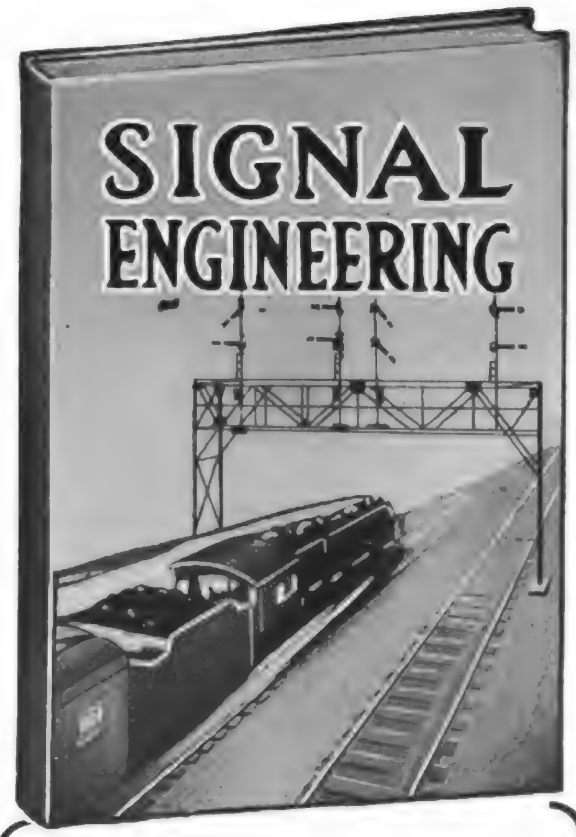


# Free Book

## On Signal Engineering

THERE are thousands of miles of railroad that must be equipped with block signal systems. To superintend these installations men are necessary. *Golden opportunities are offered.* Every ambitious man should write for the free book on Signal Engineering.

### Men Are Needed to Accept High Salaried Positions

When you stop to consider that, at the present time, less than one-fourth of the passenger lines in this country are equipped with automatic block signal systems—and when you read that the day is fast coming when the law will compel railroads to install them, you will realize what remarkable opportunities are offered to ambitious men in the profession of Signal Engineering. The work is big—broad—high salaries are paid. $250.00 a month is an ordinary salary for a Signal Engineer.

**Send the Coupon** Put your name and address in the coupon, or a letter or post card **Now** and get the free book about Signal Engineering. Too, we will tell you how you can get the training that you need in order to become a Signal Engineer. You will be under no obligation by writing for this free book. Do it Now.

**Department of Signaling** **Dept. 9199, 1810 Wilson Ave. Ravenswood Station, CHICAGO**

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**Department of Signaling**

**Dept. 9199, 1810 Wilson Ave., Ravenswood Station, Chicago**

GENTLEMEN:—Please send me absolutely free and prepaid your big new book on Signal Engineering. Also full particulars about your great special free outfit offer. It is distinctly understood that I assume no obligations of any kind.

*Name*.....

*Address*.....

*Age*..... *Occupation*.....

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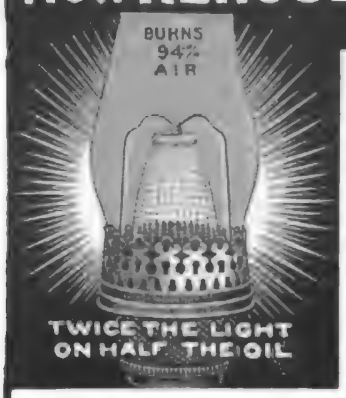
# New KEROSENE LIGHT BEATS ELECTRIC OR GASOLINE

**10 Days FREE—Send No Money**

**Men With Rigs or Autos Make**




**We don't ask you to pay us a cent** until you have used this wonderful modern white light in your own home ten days, then you may return it at our expense if not perfectly satisfied. We want to prove to you that it makes an ordinary oil lamp look like a candle; beats electric, gasoline or acetylene. Passed by Insurance Underwriters. Children handle easily. Tests by U. S. Government and 35 leading Universities show that the new **ALADDIN**

## Burns 50 Hours on One Gallon

common kerosene (coal oil), no odor, smoke or noise, simple, clean, won't explode. Over three million people already enjoying this powerful, white, steady light, nearest to sunlight. **Won Gold Medal** at Panama Exposition. Greatest invention of the age. Guaranteed.

**$1000 Reward** will be given to the person who shows us an oil lamp equal to the new **Aladdin** in every way (details of offer given in our circular). We want **one user in each locality** to whom we can refer customers. To that person we have a special introductory offer to make, under which one lamp is **given free.** Write quick for our 10-Day Free Trial Offer and learn how to get **one free,** all charges prepaid.

**Yours FREE** **Yours FREE**

**Get One FREE**

**MANTLE LAMP CO., 312 Aladdin Building, CHICAGO, ILL**

Largest Kerosene (Coal Oil) Mantle Lamp House in the World

## $100 to $300 Per Month

Our trial delivery plan makes it easy. No previous experience necessary. Practically every farm home and small town home will buy after trying. One farmer who had never sold anything in his life before writes: "I sold 51 the first seven days." Christensen, Wis., says: "Have never seen an article that sells so easily." Norring, Iowa, says: "92 per cent of homes visited bought." Phillips, Ohio, says: "Every customer becomes a friend and booster." Kemerling, Minn., says: "No flowery talk necessary. Sells itself." Thousands who are coining money endorse the **Aladdin** just as strongly.

## No Money Required.

We furnish stock to get started. Sample sent prepaid for 10 days' free trial and given absolutely without cost when you become a distributor. Ask for our distributor's plan. State occupation, age, whether you have rig or auto; whether you can work spare time or steady when can start; townships most convenient for you to work in.

# 10 Cents

WORTH OF COMMON ORDINARY **KEROSENE**

or **Coal Oil** will keep this lamp in operation for **50 HOURS** and will produce

**No Wicks to Trim**

**No Smoke**

**No Smell**

## 300 Candle Power

of the purest, whitest and best light known to science. Nothing to wear our or get out of order. Simple. Safe. Absolute satisfaction guaranteed. Send for catalog showing lamps for every purpose; also special introductory offer and agency proposition. Write today.

**KNIGHT LIGHT & SODA FOUNTAIN COMPANY, 573 Knight Bldg., Chicago**

# SUNLIGHT EVERY NIGHT

***With the New SOLAR***

Try in your own home at our risk. Gives three times the light of common lamp on half the oil. 60 candle power 50 hours on 1 gallon of kerosene. **Better, brighter, safer, cheaper** than Gas, Gasoline or electricity. Approved by Government Experts and Scientists. 500,000 satisfied users. Show the

**SOLAR MANTLE LAMP**

to parties whom we refer to you and make big profits. Write today for selling plans, exclusive free territory and introductory offer.

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# "Hang Your Own Lighting Fixtures"

**Semi-Bowl, $5.85. Plate and Ball, 85c. 4 Light Shower, $5.35**

Completely wired, including glassware. Send for new catalogue, complete line.

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# The "BEST" LIGHT

Positively the cheapest and strongest light on earth. Used in every country on the globe. Makes and burns its own gas. Casts no shadows. Clean and odorless. Absolutely safe. Over 200 styles. 100 to 2000 Candle Power. Fully Guaranteed. Write for catalog. AGENTS WANTED EVERYWHERE.

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## Pittsburgh Automatic Gas Water Heaters

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# WHITE FLAME

**BURNERS** make your old kerosene lamps and lanterns give a brilliant white light better than electricity or gas. Doubles your light. Saves oil. **NO MANTLE TO BREAK.** Guaranteed Safe and Reliable. Delights every user. Send now for complete sample (postpaid 50 cents, stamps or coin. 3 for $1.25. **MONEY BACK IF NOT SATISFACTORY.**

Live Representatives Wanted. Exclusive Territory.

**WHITE FLAME LIGHT CO., 60 Clark Bldg., Grand Rapids, Mich.**

# 300 CANDLE POWER OF LIGHT AT A COST OF 1/8c PER HOUR

## BURNS KEROSENE OR GASOLINE

Kerosene lamps make and burn their own gas from common kerosene (coal oil) and are an achievement surpassing all other known methods of artificial lighting. Same give a bright and steady white light at a very low cost, as a 300 candle power lamp will only consume one gallon of kerosene in 62 hours. The "QUICKLIT" gasoline lamps CAN BE LIT WITH AN ORDINARY MATCH like city gas.

**WRITE FOR ILLUSTRATED CATALOG** of our complete line of kerosene and gasoline lamps and lighting systems. **Agents Wanted**

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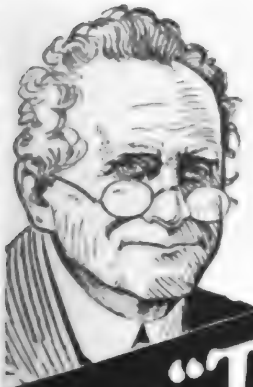

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*"The Old Stove Master"*

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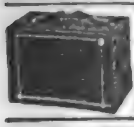

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**Rolling Bath Tub, With Heater** A Wonderful proposition — just out — everybody eager for it.

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**12172 6th St.**
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Loftis Bros. & Co.

# DIAMONDS WATCHES ON CREDIT

ESTABLISHED 1858

## Select Your Christmas Gifts from Our Jewelry Catalog. Send for it Today.

Our Diamonds are distinctive in beauty, of great brilliancy, set in the latest fashionable Solid Gold Mountings.

**The Best Gift of All**

**We Prepay Shipping Charges**

We are offering wonderful values in Diamond Rings, special for Christmas presents, at $25, $50, $75, $100, $125. Credit terms, one-fifth down, balance in eight equal amounts, payable monthly. See Catalog.

## Suggestions for Christmas Presents

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| Diamond Rings, Solitaire | $25 up | Diamond Cuff Links | $ 5 up |
| Loftis Solitaire Diamond Cluster Rings . . . | 100 up | Diamond Scarf Pins | 8 up |
| Diamond La Vallieres . | 10 up | Wrist Watches . . | 22 up |
| Diamond Brooches . . | 7 up | Watches, gold filled . | 18 up |
| Diamond Ear Screws . | 25 up | Cameo Rings, Diamond-set . . . | 12 up |
| Diamond Studs . . . | 10 up | Vest Chains, solid gold | 12 up |

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You can make $12 to $18 per day for yourself. Scores of proprietors of American Box Ball Alleys are making $100 a week or more from just two alleys. C. T. Patterson, of Illinois, opened three alleys and cleaned up $800.70 the first two months. Now he operates eight alleys and out of the proceeds has built a beautiful 3-story home.

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American Box Ball becomes the rage wherever it is started. More fun than ordinary bowling. Practically 100 per cent profit. No advertising expenses—no helpers, no wages to pay. Pins are reset and balls returned automatically. Wonderful automatic electric lighted score-board. Write for full description and particulars of our special proposition to live men.

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SMALL INVESTMENT STARTS YOU
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For store fronts, office windows and glass signs of all kinds. No experience necessary. Anyone can put them on and make money right from the start.

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You can sell to nearby trade or travel all over the country. There is a big demand for window lettering in every town. Send for **Free Samples** and full particulars.

**Liberal Offer to General Agents**
**METALLIC LETTER CO., 433B N. Clark St., Chicago**



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Should be easily made selling our Concentrated Non-Alcoholic Food Flavors, Soaps, Perfumes and Toilet Preparations. Over 100 kinds, put up in collapsible tubes. Ten times the strength of bottle extracts. Every home in city or country is a possible customer. Entirely new. Quick sellers. Good repeaters. Not sold in stores. No competition. 100 per cent profit to agents. Little or no capital required. Elegant sample case for workers. Start now while it's new. Write today—a post card will do—for full particulars **FREE**

**AMERICAN PRODUCTS CO., 1861 American Bldg., CINCINNATI, O.**


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# The typewriter that visited the King

Hammond

MULTIPLEX

The most *wonderful* typewriter in the world and the most *famous*.

The wonder of it—it writes all languages from Eskimo Indian to Kata Kana Japanese and over 365 different type sets—for every profession, every business, every science. Just turn the knob to change language or type.

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**No Other Typewriter Can Do This—**

Small Roman-neat business
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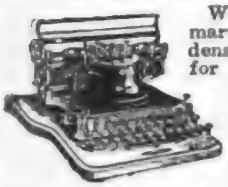

Write for booklet showing the many marvels of the Multiplex—how it condenses type for notes and extends type for headlines. how it puts the same power of emphasis into the written word that oratory puts into the spoken word. How it writes technical signs and symbols for engineering, mechanics, etc. Ask about the Mathematical Multiplex.

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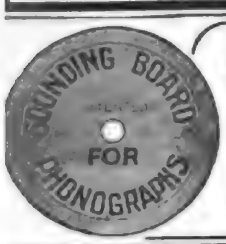


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Placed under record on any disc phonograph.

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Perfect hearing is now restored in every condition of deafness or defective hearing from causes such as

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*"Little Wireless Phones for the Ears"*—require no medicine but effectively replace what is lacking or defective in the natural drums. They are simple devices, which the wearer easily fits into the ears where they are invisible. Soft, safe and comfortable to wear at all times.

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# Sale of Seaplanes, Engines and Spares by the Navy

There will be offered for sale by OPEN SALES AT APPRAISED PRICES at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., the following aeronautical equipment at the prices stated each.

| | | PRICE | |
|---|---|---|---|
| 69 | HS-2-L Flying boats | $6160.00 | Brooklyn, N. Y. |
| 26 | Sets spare parts for HS-2-L | 1500.00 | " " |
| 72 | Handling trucks for HS-2-L | 200.00 | " " |
| 46 | H-16 Flying boats | 11,053.00 | Philadelphia, Pa. |
| 46 | Handling trucks for H-16 | 300.00 | " " |
| 20 | F-5-L Flying boats | 12,400.00 | " " |
| 20 | Handling trucks for F-5-L | 300.00 | " " |
| 68 | Aeromarine type 39-B seaplanes | 3000.00 | Gloucester, N. J. |
| 10 | Sets spare parts for 39-B seaplanes | 2500.00 | " " |
| 14 | Handling trucks for 39-B | 75.00 | " " |
| 10 | Aero Model 40 Flying boats | 4000.00 | Hampton Roads, Va. |
| 1 | Seaplane JN type twin engine | 2000.00 | Philadelphia, Pa. |
| 1 | Aeromarine type 39-A seaplane | 1500.50 | Gloucester, N. J. |
| 245 | Curtiss OXX-6 Engines (new) | 1207.50 | " " |
| 49 | Curtiss OXX-6 " (used) | $690-1035.00 | " " |
| 13 | Curtiss OX-2 Engines 90 HP | 1035.00 | " " |
| 3 | Curtiss OX-5 " 90 HP | 1035.00 | " " |
| 13 | Curtiss OXX-3 Engines 100 HP | $690-1035.00 | " " |
| 2 | Hall-Scott engines 100 HP | 1150.00 | " " |
| 12 | Gnome engines 100 HP (new) | 1500.00 | " " |
| 20 | Gnome " 100 HP (used) | 900.00 | " " |
| 2 | Salmson-Hydro-Glycier engines 220 HP (used) Type A-9 (Direct Drive) | 175.00 | " " |
| 7 | Salmson-Hydro-Glycier Engines 220 HP (used) Type A-2-C (Chain Drive) | 175.00 | " " |
| 1 | Boeing Tractor seaplane | 1500.00 | " " |

Appraised value of used motors depends upon number of hours flying time. Most of this equipment is new and in excellent condition; many of the planes have never been uncrated.

The above equipment is stored at the Fleet Supply Base, South Brooklyn, N. Y., Naval Aircraft Factory, Philadelphia, Pa., Naval Aircraft Storehouse, Gloucester, N. J., Naval Air Station, Hampton Roads, Va., and Naval Operating Base, Hampton Roads, Va. The notation opposite the items gives location where stored. Prices are f. o. b. point of storage.

Sales will be made subject to prior sale and approval. The quantities and appraised values are subject to change without notice.

Application to purchase any of the above equipment should be made to the Salvage Section, Bureau of Supplies and Accounts, accompanied by deposit for 5 per cent of the amount bid. Effort will be made to make awards in the order in which offers are received.

Inspection is invited and may be arranged for with the Supply Officer of the above Naval Stations. Schedules of Sale giving full description and complete data as to terms of sale are obtainable from the above officers or from the Salvage Section, Bureau of Supplies and Accounts, Navy Department, Washington, D. C.

JOSEPHUS DANIELS,
Secretary of the Navy.

10/6/19.


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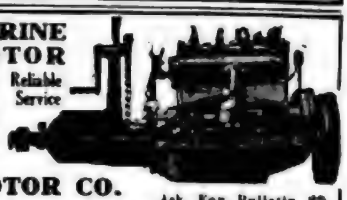
9-12 H. P. 4 Cycle 4-Cylinder. Speed range 300 to 1800 R. P. M. Adapted to boats from 14 to 30 feet. Write to

Reliable Service



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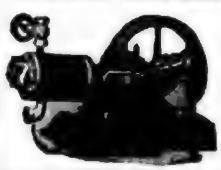
**Small Steam Engines and Boilers**



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Whether for work boats or pleasure—there is a Kermath that will exactly fit your need—10-12, 16-18, and 20-25 H. P.—all four cylinders. Prices $380 to $530—varying according to equipment.

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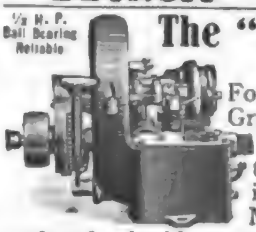
**DETROIT MICHIGAN**

**The "Hafa-Hors" Engine**
**Gas or Gasoline**




For running Cream Separators, Grain Graders, Churns, Washing Machines and other small tools. Foot Pedal Starter makes it as convenient as an electric Motor. All moving parts safely enclosed. An ideal woman's engine. Safe, Reliable and Economical. Sold under an absolute guarantee.

*See local dealer or write us for Catalog*

**ELGIN GAS MOTOR COMPANY, 65 River St., ELGIN, ILL.**

**Mullins Steel Boats Can't Sink**

When you think of buying a boat, whether it be a 30-foot Runabout, a big 70-foot Auto Boat, or something in between—remember that Mullins Steel Boats are guaranteed for Life. They cannot sink, leak, water-log, dry out or open at the seams—never require caulking. Designed by America's foremost naval architects—built in the largest boat factory in the world. More than 65,000 in use. Big catalog of steel or wooden motor boats, row-boats or canoes, on request.

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**MARINE ENGINES**

3 H. P. single and 6 H. P. double cylinder, all iron or copper jacket, aluminum base, light weight, for canoes and small boats.

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**Get this L-A Engine Book**

—it gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

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Detachable Rowboat and Canoe Motors are standard—Built-In Flywheel Magneto Automatic Reverse. New method of balancing gives wonderfully even and vibrationless running. Send for Catalog

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Will drive your rowboat anywhere it will float. Goes through weeds like an eel.

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pivots on stern of boat. Can be raised or lowered. Steers with propeller. Goes 5 to 10 miles per hour. We build our Caille Five-Speed Motor and inboard motors 2½ to 30 h.p. Send for details.

**$58.00** Complete

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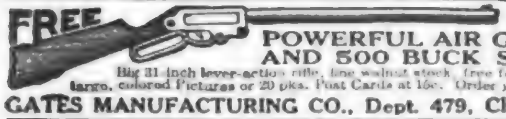
812 Caille Bldg. Detroit, Mich.

**Engine User-Agents Wanted**

Men wanted in every county to USE, demonstrate and sell "BIG HEN"—wonderful new gasoline engine for every work. Big demand. Liberal profits. Free details and introductory offer. C. Benningbofen & Sons, Department 511, Hamilton, Ohio.



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**Bevo**

THE BEVERAGE

*The all-year-'round soft drink*

**A word that is imbedding itself in our language. Soon to appear in all good dictionaries.**

*What Webster's will say about it:*

B-E-V-O, (n.) [<OF. *bevve*. <*bevee*, drinking. <*bevre*, drink. <L. *bibo*, drink.] A delicious non-alcoholic beverage, noted for its purity, nutritive qualities, sparkling golden color and richness of natural flavor of the ingredients from which it is manufactured. Became nationally popular, with all classes, in a single season. Created by Anheuser-Busch, St. Louis, and manufactured in great quantities in the most modern, sanitary and perfect beverage plant in the world.

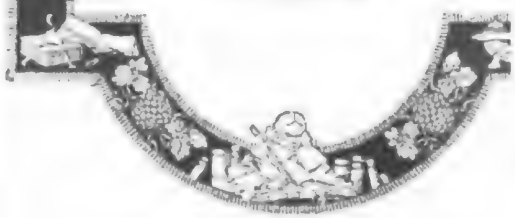
Synonyms: None. Antonyms: About 200 imitations put up in bottles similar to the Bevo package, and bearing names as nearly like Bevo as the law will permit.

*Derivative: Bevoer—one who constantly enjoys the best of soft drinks.*

*Serve it cold*

**ANHEUSER-BUSCH**

ST. LOUIS



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# AGENTS

## New Kerogas Burner
## Makes Any Stove a Gas Stove

**Burns Common Coal Oil (Kerosene)**

## Sells in Every Home

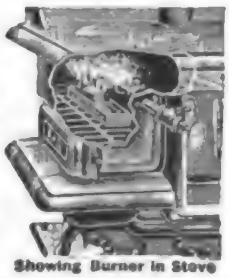
## Fits Any Stove

Makes a gas range out of your old cook stove or heater. Easy to install—just shove it into the fire box. No trouble to operate or keep clean. Just supply it with fuel.

## No Coal—No Dust—No Ashes
## Burns Just Like Gas

Cuts down on the housework. No kindling to cut—no coal to carry—no ashes to empty. Just a clean, gas-like flame. Quickly lighted. Extinguished instantly by the turn of a valve, just like gas. Necessary winter and summer.

## ABSOLUTELY SAFE


Showing Burner in Stove

**Burns Kerosene (coal oil). Can't** Explode. Do away with dangerous gasoline stoves. The Kerogas is better and altogether safe. Fire prevention is better than Fire Insurance.

**Clean, Odorless, Cheap, Wonderful Labor Saver**

The Kerogas pays for itself in a very short time in the money it will save. Helps cut the high cost of living.

## Aker Averaging 8 Sales Every Day

The Kerogas is a wonderful money-maker for agents. Aker averaging 8 sales a day, says he expects to sell a dozen a day when he gets fairly started. Carleton made $17.50 in a day and a half. M. G. Emanuel writes: "It's a wonder. I'll keep you busy filling orders." "Can sell 25 Burners right here in my locality."—Roy F. Mills. W. E. Aton sold 12 first day.

Agents get busy quick on this new, big money-making proposition. Almost every home a prospect. Women wild about it. Low price makes quick sales. Big profits. Easy to carry and demonstrate. Your territory is open. WRITE QUICK FOR DEMONSTRATING SAMPLE TO WORKERS.

**THOMAS BURNER CO., 2848 Gay St., Dayton, O.**

# Make Big Money AND WORK FOR YOURSELF

**Here's your chance to be independent, with a good income that will grow bigger every day.**

You can build up a paying business supplying the urgent demand for the

## HO-RO-CO

line of household specialties, pure remedies, toilet articles and soaps. Guaranteed quality satisfies users and brings big repeat orders. Sales are easy—profits large.

*Ho-Ro-Co goods carry a positive guarantee of satisfaction or money back.*

**Our Leader—Ho-Ro-Co Tonic** is a recognized blood-purifier and health builder. One trial makes a permanent customer.

**Ho-Ro-Co Skin & Scalp Soap** prevents dandruff, promotes hair-health, pleases buyers every time.

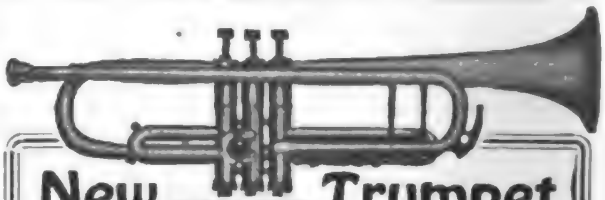
**FREE SAMPLE CASE**

To start you in your own business, we furnish without cost to you this handsome complete Sample Case. Sells goods at sight.

Get in on this opportunity today. Work for yourself.

Write for particulars.

Ho-Ro-Co
Mfg. Co.
151 Locust St.
St. Louis, Mo.



# New TRIPLE TONE Trumpet

**Plays in C, B♭, and A**

This superb Blorite "Triple Tone Model Trumpet" cannot be equalled for indoor and outdoor work. Just what musicians have long wanted. Prove to yourself, in your own home, its superior tone and quality.

**Sent on Trial**
**Easy Terms**

Don't buy a cornet or trumpet until you have tried the Triple Tone Blorite. Send today for illustrated catalog, just out, of Blorite cornets, trumpets, trombones, fifes, bugles, drums, etc.

*SPECIAL LOW INTRODUCTORY PRICES.*

**Blorite Instrument House,** Dept. E Naperville, Ill.

## A Double Money-Maker

Every auto repair shop should have this steamer. Softens compound in batteries for easy opening while you are busy elsewhere. Makes distilled water for filling batteries. You can make money with an

**AMBU Battery Steamer**
WITH CONDENSER

Opens batteries without chance of breakage. Simple, easy to operate—low upkeep—efficient and economical. Price complete $35. Ask for circular A of other battery shop money-makers.

AMERICAN BUREAU of ENGINEERING, 601-16015 Michigan Ave., Chicago

## Cleartone Phonographs
### $4.00 to $200.00 Retail

Our Sundry Dept. offers Needles 39c per thousand in lots of 500,000. Motors $1.35 to $14.75 each. Tone-Arms and Reproducers $1.90 to $5.75 per set. Main Springs 20c to 90c each. Records, Needles, Sapphire Points and Parts at reasonable prices.

Write for our 84 page catalogue, the only one of its kind in America, illustrating 30 different styles of Talking Machines and over 500 different Phonographic Parts.

**LUCKY 13 PHONOGRAPH COMPANY**
Export Dept. 46 H, E. 12th Street, N. Y., U. S. A.

GREEN AUTOMATIC MACHINE

# ADD TO YOUR INCOME

WITH LITTLE EFFORT
**$5 to $10** A DAY MADE EASY WITH

## New Improved Green Automatic Machine

Sharpens, Hones and Strops all kinds of safety razor blades in one operation, from four to six blades per minute. For both Quality and Quantity, this machine is in a class by itself. There is nothing like it on the market. Let us send you our free booklet explaining everything, including the **"AMERICAN" Key Cutter**—cuts square, angular or round slots.

**AMERICAN SHARPENING MACHINE CO. (Inc.), Dept. 12, 184 W. Washington St., CHICAGO**

"AMERICAN" Key Cutter

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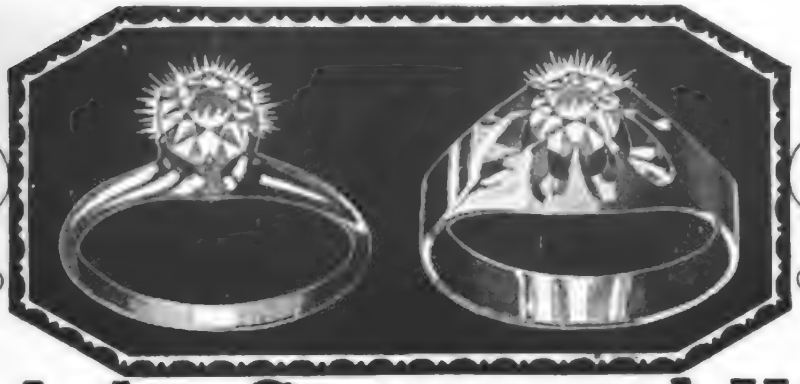

# Send the Coupon and We'll Send You a Lachnite

Don't send a penny. Upon your simple request we'll send you a genuine Lachnite gem mounted in either of these solid gold rings on 10 days trial. These exquisite gems have the eternal fire of diamonds. Over 150,000 people have accepted this offer and have found the way to own beautiful jewelry at a trifling cost.

## If You Can Tell It From a Diamond Send It Back

When the ring comes make the first small deposit ($4.75) with the postman. Wear it 10 full days. If you can tell from a diamond send it back and we'll refund your deposit. If you decide to buy, merely pay the balance at $2.50 a month. The total price of either ring is only $18.75.

## Send Coupon—No Money

Send us your name and address today. Use the coupon or a letter or a post card. Be sure to send your finger size. To do this cut a strip of paper just long enough to meet over the second joint of the finger on which you wish to wear the ring. Send the coupon now—and not a penny in cash.

**Harold Lachman Co.,** Dept. T 1199 12 N. Michigan Ave. Chicago, Illinois

**Harold Lachman Co.,** Dept. T 1199 12 N. Michigan Ave. Chicago, Illinois

Send me prepaid, Ladies' / Men's ring on 10 days' free trial. When it comes I will deposit $4.75 with the postman. After ten days I will either return the ring or send you $2.50 a month until the balance is paid. Total cost to me $18.75. If I return the ring, you will refund my $4.75 immediately. I enclose my finger size.

*Name* .....

*Address* .....

---

FOR HEADACHE AND NEURALGIA

**AK ANTI-KAMNIA TABLETS**

10c & 25c PACKAGES

ASK FOR A-K TABLETS

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***Lost***— A valuable key. Dropped it in the dark. Burned my fingers several times with lighted matches. Could have found it instantly with an Eveready DAYLO—the light that says, "There it is!"

---

## Mammoth Jubilee Book Free

Picturing 5152 Home Things

Make your own Credit Terms—1 to 3 years' time.

SPIEGEL, MAY, STERN CO., 1108 W. 35th St., Chicago

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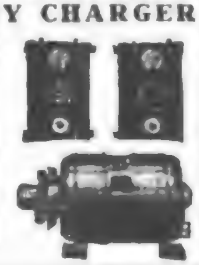
## BATTERY CHARGING PAYS Bigger Profits This Winter

With winter at hand and cars being stored, HB battery charging can pay you $150 to $250 extra profit every month. Anyone gets the business of charging those batteries—who has one! Start now—get a sturdy, dependable HB Charger with ample capacity to handle this profitable business.

### THIS HB 16-BATTERY CHARGER

Recharges 1 to 16 6-volt batteries or equivalent at once. Uses 2 or 3 phase city current—cheapest and best. Current cost 10c to 15c each—owner pays 75c to $1.50. Quick, clean, permanent profits easily made.



**Small Payment Puts This Money-Maker in Your Garage or Shop**

Balance on easy monthly terms. Furnished complete with 2 8-battery capacity charging panels. No burnouts or expensive renewals. Absolute Money-Back Guarantee. Pin this ad to your letterhead and mail TODAY for information.

**HOBART BROTHERS COMPANY**
**Box M1210 TROY, OHIO**

*Successful Manufacturers Since 1895*

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**NEW-SKIN**

***First Aid For Cuts and Scrapes***

Keeps out germs.
Protects from infection.)

Have it on hand for emergencies.

In two Sizes, at all druggists.

NEWSKIN CO., NEW YORK

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$1 a WEEK PAYS FOR THE Black Beauty

Your Christmas Bike!

Just think! You can have the world's most magnificent bicycle and still use your Christmas money for other things. We'll trust you with the Black Beauty. Finish paying for it next year—a little each week or month; and only a small deposit when it arrives.

Write Quick for Catalog. Tell us which model to ship. Send no money. Keep the Black Beauty, or return at our expense. We take all risks and pay all freight. Easiest and most satisfactory bicycle getting plan ever invented.

Remember, Black Beauty isn't an ordinary wheel. It has 18 Exclusive Features Designed for chaps who want the classiest, most dazzling bike in all cycledom. And because we build Black Beauty in our own big factory you get it at Factory Wholesale Price—no middle men's profits. Get your Black Beauty for Christmas and receive Repair Kit, Tool Case and Stand FREE. Also 6 yr. Guarantee and 6 mos. free accident insurance.

40 Styles

SUNDRIES Get our factory prices. Positively lowest in the country. TIRES, stands, lamps, horns, parts, supplies, etc. Everything for cyclists. Free Sundries Catalog.

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Haverford Cycle Co. Dept. F76 Phila. Pa.

Send TO-DAY for FREE CATALOG (in colors) Select your model. We ship on approval

DENINGER WILL SAVE YOU 25 TO 50 DOLLARS

$40

BIG MONEY SAVINGS FOR YOU

Used and rebuilt motorcycles, single and twins, $25 to $100. Used bicycles, $5.00; tandems, $10. All machines guaranteed in good working order. New bicycles and motorcycles at Factory prices. You save dealers' profits. Motorcycle and automobile tires too, $2.00. Complete line of parts and supplies.

Send for catalog Deninger Cycle Co., Rochester, N.Y.

Make Your Bike a MOTORCYCLE

Make your "foot-power" bike a dependable, easy-running, light-weight motorcycle at small cost. You can do it yourself with the

SHAW MOTOR ATTACHMENT

Compact. Easy to attach. No special tools required. Battery or magneto. Thousands in use. Write at once for free book, prices, terms; also about Shaw Motorbicycle.

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SHAW MFG. CO. Dept. 312 Galesburg, Kans.

95 to 125 Miles per gallon!

Please Mention Popular Mechanics

Why Plod Along Without a Cleveland?

You'll get a machine some day. Don't leave it to luck. Start now by having a good look at the Cleveland. A thorough examination of its lightness, simplicity, and unusual mechanical merits will make you agree that it is what you need. Then at the price, which ought to be higher, you are getting the best motorcycle value on the market.

If you can't see a Cleveland in your neighborhood, write us for a full description. The Cleveland is known all over the world and is easy to buy, ride, control and maintain. Single Chain Worm Drive; Valveless Motor, 75 miles to the gallon of gas; plenty of power and speed. *ACT NOW*

The Cleveland

THE CLEVELAND MOTORCYCLE MFG. CO.

CLEVELAND, U. S. A.

VITALIC Bicycle Tires

TRADE MARK REGISTERED

*"Tougher Than Elephant Hide"*

THE CORBIN DUPLEX COASTER BRAKE

is the standard brake equipment, assuring absolute control. Equip it now. Send for 1919 catalog.

THE CORBIN SCREW CORP. The American Hardware Corporation, Successor

NEW BRITAIN, CONN. BRANCHES, New York, Chicago, Philadelphia

$40 Motorcycle

We have the largest line of new and used motorcycles in the country at the lowest prices. Every machine guaranteed. Send for catalog. We are the largest and only exclusive motorcycle supply house in the world. Repairs a Specialty. Send us your machine to be overhauled. Motors and castings for airships and railway velocipedes. WE EXCHANGE MOTORCYCLES.

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BIG PROFITS IN VULCANIZING

We manufacture the Anderson Vulcanizers and teach you the Famous Anderson Method of Vulcanizing in 5 to 10 days in our State School nearest to you, and guarantee to make a first-class vulcanizer out of you or refund your money. Many of our graduates make over $3,000 a year.

Visit the city of our nearest school where you can see all other makes and hear their Method of doing the work; then visit our Anderson school and get our Method. Go prepared to take five to ten days course of the Anderson Method and you will know why our graduates make good.

If you do not buy then our course costs you $25.00, and any time thereafter if you buy, or if you buy at the start, you will be paid $2.00 per day expense money, because we sell the work you do.

Anderson Steam Vulcanizer Company

2 Williams Bldg., Indianapolis, Ind., U. S. A.

*Please print your name. We receive many we cannot make out.*


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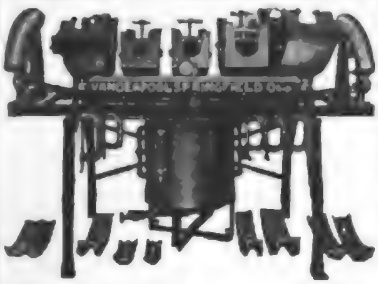
***Men without previous experience can get into a very profitable, fast-growing business***

Everyone makes money in the TIRE VULCANIZING BUSINESS. Profits 100% or more. Small investment. We are pioneers in the manufacture of the dry cure vulcanizer.

# The Vanderpool Vulcanizer Outfit

Repairs tires by the correct method. The Vanderpool Principle is endorsed by the great tire factories, also by veteran repairers after trying others.



We send you FREE TIRE REPAIRING MANUAL. If others have been successful, so can you be. Write today for full particulars.

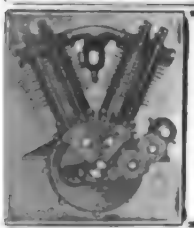
In answering address *Dept. B.19.*

**Wm. Vanderpool Co., Springfield, O.**

Glidden Auto Finish will make your old car look like new. Get color card from your paint dealer.

**GLIDDEN**

PAINTS · VARNISHES · COLORS · INSECTICIDES



**12 to 15 H.P. Motor, $67**

with carburetor; also furnished with unsparker and magneto

Just the thing for aircraft, excursers, motor sleds, railroad speeders etc. Can also be supplied with cooling fan for stationary purposes. A lightweight, high speed, high efficiency valve in head motor, weighing 85 lbs., which has made good in actual service. Order from this advertisement. We guarantee motor as represented. Circular "A" mailed on receipt of stamp. Assembly prints mailed on receipt of 25 cents. Parts supplied for Ford, Motorcycles and Mack Motors. Prices subject to change without notice.

**Lake Motor Co., Box 630, Milwaukee, Wis.**

**STANDARD MAKE**

**USED TIRES**

SAVE 75% ON YOUR TIRE BILL

**Biggest Tire Bargains Ever Offered**

| SIZE | Used Tires | New Tubes |
|---|---|---|
| 30 x 3 | $ 4.50 | $1.75 |
| 30 x 3½ | 5.50 | 1.90 |
| 32 x 3½ | 7.00 | 2.03 |
| 31 x 4 | 7.00 | 2.05 |
| 32 x 4 | 7.50 | 2.15 |
| 33 x 4 | 9.00 | 2.25 |
| 34 x 4 | 9.00 | 2.35 |
| 34 x 4½ | 9.25 | 2.60 |
| 35 x 4½ | 10.00 | 2.65 |
| 36 x 4½ | 10.00 | 2.75 |
| 35 x 5 | 10.50 | 2.85 |
| 37 x 5 | 11.50 | 2.95 |

**ORDER NOW.** Send $1.00 deposit for each tire ordered. Balance C. O. D. subject to your examination. State whether S. S. or Cl. is desired. *Discount of 5 per cent when full amount accompanies order.*

**Goodway Tire Co.,** 1403 Michigan Avenue, Dept. P, CHICAGO, ILL.

# Replace Broken Window in 10 Minutes with a "STIK-TITE"

FORD

OVERLAND

DODGE FORD

BUICK-HUDSON

HUPMOBILE

**PATENTED**

Anyone can stick this window on like a tube patch without tools or extra expense, without removing back curtain—without loss of car's use. It lasts longer. No metal fasteners, no stitching perforations to weaken celluloid.

Makes very neat appearance and when once attached, practically becomes part of your back curtain. Made in exact sizes for practically all popular cars.

Prices 60 cents up complete, according to size. See your dealer or write to address below.

We also furnish Tops Complete or Top Recoverings for all cars; have patterns for most popular models and can mail recovering to fit.

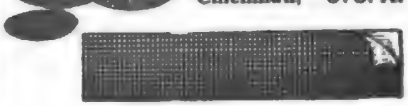
**Protect your car with our "WARNER" Seat Covers, "Frost King" Radiator and Engine Covers. Repair with Stik-Tite Roof Patches, and Lily-White Tube Patches.**

**DEALERS WRITE FOR SUCCESSFUL PLAN THAT BRINGS YOU NEW CUSTOMERS AND EASY SALES.**

*We are experienced in handling foreign business.*

**The Cincinnati Auto Specialty Company**

Dept. 12A 242 Main St. Cincinnati, U. S. A.

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INSTALLATION of a New Stromberg Carburetor on any car, insures prompt starting, instant acceleration, maximum speed, power and flexibility in coldest winter weather.

—and guarantees greatest of fuel economy—most miles per gallon of gasoline.

Send name, model and year of your car for complete descriptive matter—and time, trouble, money-saving facts.

**Stromberg Motor Devices Co.**
Dept. 1214, 64 E. 25th St.
Chicago, Ill.

# New STROMBERG Does it!
## CARBURETOR

## STANDARD Demonstrating TIRES

| Size | Tires | Tubes |
|---|---|---|
| 30x3 | $ 6.50 | $1.75 |
| 30x3½ | 7.50 | 1.90 |
| 32x3½ | 9.00 | 2.00 |
| 31x4 | 9.50 | 2.05 |
| 32x4 | 10.50 | 2.15 |
| 33x4 | 11.50 | 2.25 |
| 34x4 | 12.50 | 2.35 |
| 33x4½ | 13.50 | 2.50 |
| 34x4½ | 13.50 | 2.60 |
| 35x4½ | 14.00 | 2.65 |
| 36x4½ | 15.00 | 2.75 |
| 35x5 | 15.50 | 2.85 |
| 37x5 | 16.50 | 2.95 |

**SEND NO MONEY—JUST THE COUPON**

**ROYAL TIRE & SUPPLY CO.**
**1461 Michigan Ave.**
**Dept. P Chicago, Ill.**

Ship by Express—Parcel Post (state which)—slightly used. **Demonstrating Tires and Tubes** I have checked, with privilege of examination. If satisfactory will pay C. O. D. Want S. S.—Cl.—(state which).

**Name**.....

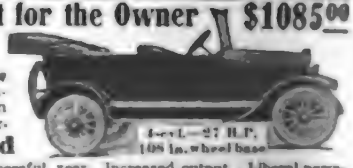
**Address**.....

**Postoffice**..... **State**.....

5% allowed if full amount is sent with order.

## The Seneca Motor Car Co. Built for the Owner $1085.00

Simple, sturdy construction. Low cost of up-keep and operation. Cantilever springs in rear. Comfortable, easy-riding.




**Dealers Wanted**

Immediate deliveries. Fifth successful year. Increased output. Liberal newspaper advertising in dealers' territory. Wonderful opportunities. Write or Wire NOW

THE SENECA MOTORCAR CO., 32 Seneca Factory, FOSTORIA, OHIO

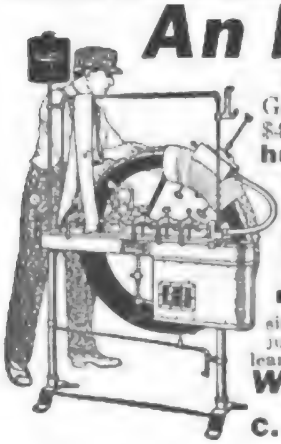
## GREB RIM TOOL

**Operates all types of cross-split rims** "Wallop" your rim with a hammer to force it in or out of place and you are bound to have greater trouble next time. **DO THE SENSIBLE THING:** Provide yourself with the best rim tool on the market and save time, trouble and rims.

**Ten Days' Trial** If your dealer or jobber does not have them, we will send you one. Try it ten days. If not satisfactory, return it to us and we will refund your money. We also make the Greb Automatic Grip Puller.

THE GREB CO., 193 State St., BOSTON

# An Easy Way to Make Money



**Don't be content to plod along on a small salary. Be independent.** Go in the tire repairing business and make $60 or more a week. One man made $45 the first day he received his outfit. **Others are making $25 a day and hundreds of wide-awake men are making $200 to $500 a month.** No experience needed. We teach you how. Very little capital required. But alight risk, as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day.

## SHALER Tire Repair Outfit, $70

**will do as much and as perfect work as the big $250 to $500 vulcanizing outfits.** A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has **Automatic Heat Control.** It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

**WRITE FOR FREE BOOK** "HOW TO OPEN A TIRE REPAIR SHOP" and complete Catalog, which gives full information.

WRITE QUICK BEFORE SOME HUSTLER GETS AHEAD OF YOU.

**C. A. SHALER CO., 2011 Fourth Street, WAUPUN, WIS.**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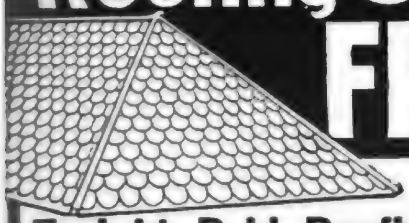
# Roofing Book FREE



## Get Our Freight Paid Roofing Prices

Don't buy Roofing of any kind until you get our big Free Roofing Book, describing full line of Edwards Famous "Tightcote" Galvanized Roofings, Sidings and Ceilings, and our lowest freight-paid prices. Then see for yourself how much we save you by selling direct and saving you all in-between dealers' profits.

## EDWARDS "REO" Metal Shingles

Absolutely rust proof. By our patented "Tightcote" process, edges as well as sides of metal sheets are heavily coated with zinc—not a space the size of a pin point exposed to weather. Fire and lightning proof. Outlasts three ordinary roofs. Forever wind and weather proof. Need no repairs—end all roofing expense. Patent INTERLOCKING DEVICE makes water tight seams—all nail heads covered—no chance for rust or leaks.

### EDWARDS Galvanizing Test

Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

**Low Priced Garages**

Wide variety of styles, all sizes of Portable Fireproof Metal Garages. Lowest prices ever made. Postal brings Big Garage Catalog free.

**Write Today** for free samples and proof that we can save you a lot of money on any kind of roofing, siding or ceiling you may need. Ask for Roofing Book No. 250.

**FREE Samples & Roofing Book**

**THE EDWARDS MFG. CO.,**
1200-1250 Pike St., Cincinnati, O.

# TIRES ¼ LESS

**PRE-WAR PRICES!** Save Big Money on Fresh, New Tires. Plain and Non-Skid. **No Seconds.**

**GUARANTEED 7500 MILES** WILL RUN 10,000

We pay the war tax.

**TIRES FREE** Secure agency proposition and get your tires FREE. Write today for Free Book and Agency Offer.

**WALTER DAVID RUBBER CO.** 308 Pershing Road KANSAS CITY, MO.

# Tire Agent

We want one exclusive representative in each locality to use and sell the new Mellinger Extra-Ply, hand made tires. **Guarantee Bond for 8000 Miles.** (No seconds.) Shipped prepaid on approval. Sample sections furnished. Do not buy until you get our Special Direct Prices. Write

MELLINGER TIRE & RUBBER CO., 946 Oak St., Kansas City, Mo.

# STANDARD TIRES LESS THAN HALF PRICE

**Send No Money. Pay Only on Arrival —Examine and Judge for Yourself**

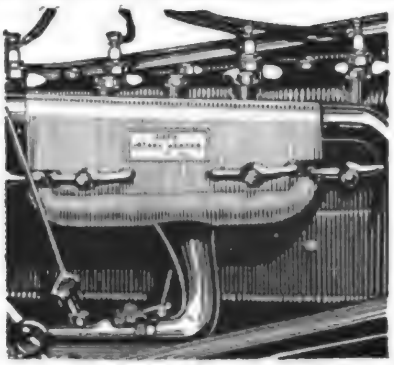
Standard make used tires in first class condition, selected for us by an expert. Tires can be readily guaranteed for 3,000 miles. **We rebuild standard make used tires into dependable long mileage tire bargains.** And your money back if you don't like them. Do not confuse these tires with double tread or the so-called slightly used and demonstrating tires.

| Size | Tires | Tubes | Size | Tires | Tubes | Size | Tires | Tubes |
|---|---|---|---|---|---|---|---|---|
| 30x3 | $ 7.75 | $2.25 | 32x4 | $11.90 | $3.45 | 34x4½ | $14.75 | $4.45 |
| 30x3½ | 8.75 | 2.45 | 33x4 | 12.90 | 3.65 | 35x4½ | 14.90 | 4.35 |
| 31x3½ | 9.50 | 2.95 | 34x4 | 13.70 | 3.75 | 36x4½ | 15.00 | 4.60 |
| 32x3½ | 9.75 | 2.70 | 36x4 | 10.90 | 4.55 | 37x4½ | 16.50 | 4.70 |
| 31x4 | 10.50 | 3.25 | 32x4½ | 13.25 | 4.15 | 35x5 | 17.80 | 4.75 |
| | | | 33x4½ | 14.25 | 4.35 | 37x5 | 17.90 | 4.90 |

**State Make Desired. If We Have It We Will Ship It**

We guarantee satisfaction. If not satisfied upon examination, goods may be returned to us at our expense. In ordering specify straight side or clincher, nonskid or plain.

**Cleveland Tire Co.** 3112 Michigan Avenue, CHICAGO, ILL.



# Jiffy Manifold Heater for Ford Cars

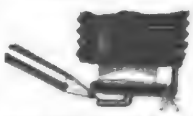
## Only $1.00 Postpaid

The investment of $1.00 in a Jiffy Intake Manifold Heater pays big returns—not only in greater mileage per gallon of gas, but in greater comfort and easier starting. Big production makes the low price possible. Many car manufacturers are equipping their engines with manifold heaters knowing that greater efficiency results. You yourself can bolt the Jiffy on your Ford engine in five minutes, no adjustments to be made, nothing to get out of order. Send along a dollar, and by return mail we will ship your Jiffy on an absolute guarantee that if you are not entirely satisfied you can return it and get your money back. Remember—it saves from 25c to $1.00 every time the gas tank is filled.

# TWIN FIRE

We also make the well-known Twin Fire Spark Plug—the only plug of its kind. Fires two distinct sparks, and if one point fouls the other continues to fire. Before you buy another plug investigate Twin Fire—ask your dealer to show you the "lead pencil" test—the test that shows up the truth in spark plugs.

Ordinary plug is dead when even one point fouls.



Twin Fire always fires. Short one point and the other still fires. One point cleans the other.

**Dealers:** Get details of our dealer proposition on both the Jiffy Intake Manifold Heater (retails for $1.00) and Twin Fire Spark Plug—two successful accessories.

**Twin Fire Spark Plug Company**
724 Grand River Ave.
DETROIT, MICHIGAN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# Radiator and Engine Covers

Prepare now to save gas, make starting easy, and prevent engine trouble by ordering your "Frost King" before the cold weather demand makes them hard to get.

The Frost King is the **only** cover constructed on absolutely scientific principles and was designed by one of the best insulating engineers in the country.

Frost King Covers are made in three grades. All have three-ply construction. All have a heavy **Asbestos** center. All are tailored to fit smartly. Yet the prices with the asbestos included are very little more than you must pay for the ordinary kind.

The Black Diamond quality Frost King has an exceptional covering fabric that will not crack or peel, and the inside felt lining acts like the softest polishing cloth to keep the finish on the hood in fine condition.

The De Luxe quality Frost King has extra special quality artificial leather covering in colors to match your car.

Don't delay seeing your dealer. Write us if he can't supply you.

**Dealers** look ahead! Hundreds of thousands of new cars sold this summer will **all speak at once** for covers **on the first cold day.** Are you going to be ready with a full stock for the most popular cars, and for a **Big Clean-Up** on that day?

## Car Owners and Dealers

We have added the Warner Seat Cover business to our line of Stik-Tite Windows, Auto Tops, Top Recoverings. We maintain the highest standard in fabrics and tailoring. You'll find Stik-Tite Lily-White self-vulcanizing tube patches more satisfactory than vulcanizing.

Our Stik-Tite Windows provide the quick and easy way to replace your broken back window without removing curtain. For all popular cars. Prices 60 cents up.

***We are experienced in handling export business in all our lines. Write for prices, free catalogs and samples.***

## The Cincinnati Auto Specialty Company

**Dept. 12B, 342 Main St., Cincinnati, Ohio**

***Please Mention Popular Mechanics***

# Quick Action

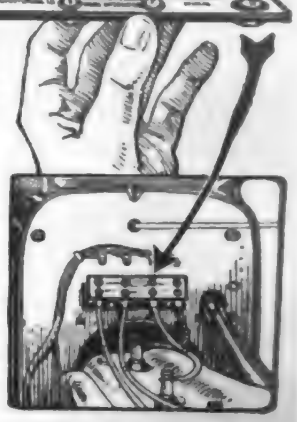
## For Money Makers

Regular $3.50 specialty. Agents make 300% to 1,000% profit. Attractive to demonstrate and gets crowds. Small, light and easy to handle.

## Spark Intensifier

**for Ford Automobiles and Fordson Tractors**

Sensational value. Selling thousands. Every Ford should have one. Simple, powerful, safe attachment gives more power, more "pep," more speed, saves gas. Easily on in three minutes—no holes to bore. Makes old, cracked or worn spark plugs work like new. Demonstration shows cracked plugs fire through grease, oil and carbon. Makes it easy to start engine when cold in winter. Reduces carbon in cylinders. Saves Gas. Sell them yourself or appoint your own agents. Each Intensifier is neatly packed in a box with price $3.50 printed on the outside.



**Sample, $2.00**

*Send money order or cash with order.*

**KIEFER MANUFACTURING COMPANY**
**406 Palace Bldg. MINNEAPOLIS, MINN.**

Here is the best auto warning signal you can buy. Attaches to engine in place of priming cup. Guaranteed to give 10 years' satisfactory service. Made in single tone and chime.

*Send for particulars.*

**BUELL MANUFACTURING COMPANY**
**2983-85 Cottage Grove Ave. CHICAGO**

# 35 Miles per hour

Is Record of this Car.

Get 1920 Plans. Ready Now.

**Boys, Build This Car.** This nifty little car driven by gasoline motor, can be built by any boy. Parts are furnished by us and are very cheap. Send 25c for building plans & price list of parts showing how to build this speedcar.

**SYPHER MFG. CO.**
**146 Warren Street**
**TOLEDO, OHIO**

# GET THIS BATTERY CHARGER

It will keep your automobile battery in fine condition and prolong its life 1 to 3 years.

**$15.00**

**F. F. Bantum Battery Booster** connected to any lamp socket will charge any 6 volt battery from 100 to 130 volts—60 cycle A. C. Current. Use it in your own garage. Cold weather lowers battery efficiency. Keep your battery in condition by systematic charging. Shipped complete with Ammeter and clips $15.00. Weighs only 10 lbs. Send check for express shipment and for parcel post include postage charges and insurance with remittance. Circular 24 gives full information and describes full line of larger sizes for both A. C. and D. C. Current.

**Francs Manufacturing Company, Cleveland, Ohio**

**INSYDE TYRES Inner Armor**

for Auto Tires. Double mileage, prevent blowouts and punctures. Easily applied in any tire. Thousands sold. Details free. Agents wanted.

**Amer. Accessories Co., Dept. PO Cincinnati**

# Akron-Williams

## TIRE REPAIR EQUIPMENT

Turns out perfect work the first time. No more "second time" jobs. Saves money, material and time. Perfected on the experience gained in equipping thousands of tire factories and tire repair businesses. *Write for catalogue.*

**THE WILLIAMS FOUNDRY & MACHINE CO.**

Everything for the Tire Builder and Repair Man — **AKRON, OHIO**

# 3¢ Worth of Miracle Motor-Gas Equals a Gallon of Gasoline

**AGENTS WANTED!** Remarkable money-maker. Exclusive territory. 800 per cent PROFIT! New, scientific, chemical discovery increases mileage 15 per cent to 40 per cent. Prevents carbon. Makes engine run smoother. SAVES GAS. Chemists' reports prove it harmless. **Guaranteed.** O. V. Darling, Ind., made $210.00 profit in 4 hours. Dave Isom, Idaho, made $80.00 profit in one day. You can, too. Write for secret proposition.

**C. A. BUTLER CO. 185 Wayne Bldg. TOLEDO, OHIO**

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# *More and Better* VULCANIZING

***will be demanded in the coming year***

Motorists are beginning to appreciate what can be done with proper vulcanizing. They will demand more of it from now on, but to hold their business it will have to be done **right.**

Those who are going into the vulcanizing business as well as those who now have shops, should investigate without delay the equipment that has revolutionized the industry and placed it on a reliable and highly profitable basis.

## The Dri-Kure Retreder

It is the only vulcanizing method on the market that is fundamentally **right** all the way through. The battery of Retreders at the left is shown rapidly turning out finished tires which will require no expensive working over—and which will be turned over to the owner guaranteed with the assurance that there will be no "comebacks" on account of deficient workmanship. As is generally the way with every successful product our name, trade mark and product are being widely imitated. For your protection as well as ours, we suggest writing for a catalog on the **real** Dri-Kure Retreder at once.

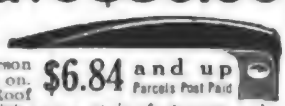
## Western Vulcanizer Mfg. Co.

*Manufacturers of Dri-Kure Retreders, Sectional Molds, Buffing Machines and other Vulcanizing Equipment*

**Dept. N** **150 North Desplaines Street** **CHICAGO**

## You Can Save $50.00

By recovering your old auto top frame yourself. We make these recovers to fit all makes and models of cars. Any person that can drive a car can put it on. We furnish instructions. Roof and quarters sewed together with rear curtain, fasteners, welts and tacks. All complete. Give us the name, year and model number of your car and we will send you our catalogue with samples and quote you exact price



**$6.84** and up Parcels Post Paid

LIBERTY TOP & TIRE CO., Dept. E7, Cincinnati, O.

## The Liberty Plane Radiator Ornament

The most popular Radiator Ornament ever produced. Fits any car, indestructible, solid aluminum, highly polished, wings hand-painted with flying emblem in Red, White and Blue. The slightest motion spins Propeller arm, and makes it seem alive. "It fairly hums with Patriotism." Postpaid $1.00; get the Agency.

DEFENDER AUTO LOCK COMPANY
500 Marquette Bldg. Detroit, Michigan

## Firestone Motorcycle Tires

Leading motorcycle makers furnish Firestone Tire equipment without extra cost to you. They are willing to pay the Firestone price in order that you may get full service from their machines.

## Essenkay THE TIRE FILLER Prevents Tire Troubles

No punctures or blowouts. Essenkay is not a Liquid. Doubles tire mileage. No tubes, spare tires, pumps. Over 75,000 satisfied users. Write for Free Trial Offer and Free Book, "The Story of Essenkay."

ESSENKAY PRODUCTS CO., 68-220 W. Superior, Chicago

## NEED AUTO PARTS?

**A Million Parts a Year Pass Through Our Great Shops. Immense Variety Always on Hand.**

**We Are the Original**

**"We Tear 'Em Up and Sell the Pieces"**

**Over 100 Makes and 300 Models on Hand**

**Save 50% to 80% on Replacements**

***Send for Latest Prices!***

Every Part GUARANTEED or Money Refunded. Write for What You Need.

AUTO WRECKING COMPANY, Dept. P, KANSAS CITY, MO.

*The Original—"We Tear 'Em Up and Sell the Pieces."*

## Delivered TO YOU FREE

Your choice of **44 styles,** color and sizes in the famous line of **"RANGER"** bicycles, shown in full color in the big new Free Catalog. We pay all the freight charges from Chicago to your town.

**30 Days Free Trial** allowed on the bicycle you select, actual riding test in your own town. Do not buy until you get *our great new trial offer,* **EASY PAYMENTS** if desired, at a small advance over our special **Factory-to-Rider** cash prices.

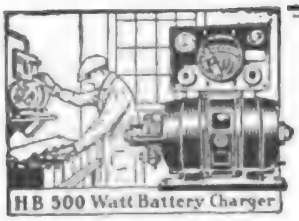
**TIRES** LAMPS, HORNS, pedals, single wheels and repair parts for all makes of bicycles at half usual prices. No one else can offer you such values and such terms. **SEND NO MONEY** but write today for the big new Catalog. **It's free.**

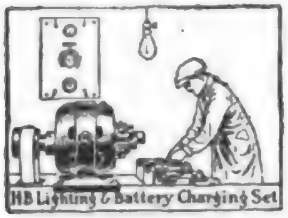
***Rider Agents Wanted***

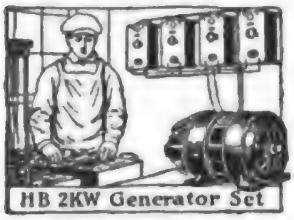
**MEAD CYCLE COMPANY** Dept. T108 Chicago

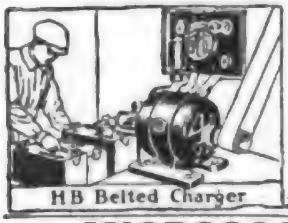
## DIAMONDS, WATCHES ON CREDIT

YOU SHOULD HAVE THE JAMES BERGMAN 160 PAGE JEWELRY BOOK IN YOUR HOME. Over 4,000 Illustrations, Diamonds, Watches, Jewelry, Toilet Articles, etc. Select any article desired, have it sent to you, all charges prepaid. If satisfactory, send one fifth of purchase price and keep it, balance in eight monthly amounts. No interest charged. No security required. **Write Today** for Big Free Catalog No. 5. It tells about Our Low Prices and binding guarantee. **JAMES BERGMAN** 37 - 39 MAIDEN LANE Estd. 1896, NEW YORK CITY


HB 500 Watt Battery Charger


HB Lighting & Battery Charging Set


HB 2KW Generator Set


HB Belted Charger

# HB Battery Charging Pays Big Profits

## You Can Make $100 to $350 Extra Profit Every Month

Charging automobile batteries is your BIG OPPORTUNITY to build a permanent, money-making business. Every car owner is a prospective customer for battery charging. It costs only 10c to 15c each to charge batteries—customer pays 75c to $1.50. *Figure that profit!* No electrical or mechanical knowledge required to install or operate an HB Charger. No burnouts, no expensive renewals, nothing to wear out or break. Only attention needed is occasional oiling. Steady, dependable service 24 hours a day, with BIG PROFITS.

## An HB Charger for Every Size Battery Business

### CHOOSE THE TYPE YOU NEED:

**HB 500 Watt Charger**

Recharges 1 to 8 6-volt batteries at once. Uses power from lines now in your garage or shop. Ideal equipment for small battery business. Should pay $100 to $200 profit a month. Runs day and night for months with practically no attention.

**HB Lighting and Charging Set**

Makes brilliant electric lights and charges batteries at same time. Saves money and makes money for you. Operates from line shaft or belting. Splendid outfit for garage not having electric current.

**HB 32-Battery Charger**

Recharges 1 to 32 6-volt batteries, or equivalent in 12- or 24-volt batteries, at one time. Four separate, complete charging panels. Should make $200 to $350 profit a month. Some users make up to $450 a month.

**HB Belted Charger**

Used only where electric current is not available. Charges 1 to 7 batteries at once. Operates from line shaft or belt. Sturdy, dependable, economical, pays big profits. Furnished complete with switchboard, ready to operate.

## Small Cash Payment Puts Any HB Charger in Your Garage or Shop—Balance on Easy Monthly Terms

The HB Company helps you start your own big, money-making battery charging business. After the first cash investment, your profits should easily carry the small monthly payments, and net a fine surplus. Every HB outfit is sold on ten days' free trial under the HB Absolute Money-Back Guarantee. *You run no risk.* Begin your HB battery business NOW, when winter brings biggest profits. Cars are stored with batteries to be kept in condition. Somebody will get this business—why not YOU! Check the picture of the HB Charger you are interested in, then tear out this ad and mail for complete information. Delays pay no dividends. Do it NOW.

**HOBART BROTHERS COMPANY**

*Successful Manufacturers Since 1893* Box M 129 TROY, OHIO

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# MICROSCOPES More Fascinating Than a Camera

**Examine foods, metals, drugs, minerals, textiles, crystals, bacteria, plant-life, etc.**

A Microscope furnishes unlimited opportunities for intensely interesting investigation of things we cannot normally see. Tells difference between cotton, wool and silk; detects adulteration in foods, reveals different forms of germ and plant life. Ideal Christmas gift.

All types and sizes and prices. Satisfaction guaranteed or money refunded. Write for particulars.

**TECHNICAL EQUIPMENT COMPANY**
**Dept. 3 D, 22-26 E. 17th St., New York City**

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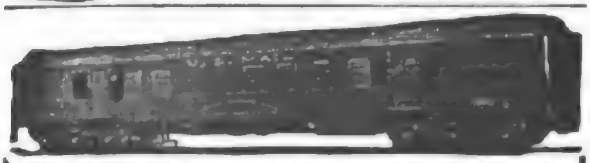

# WANTED — Railway Mail Clerks

**$1100 to $2000 a Year**

**Hundreds Needed At Once**

**Sure Pay. Life Job. Pull Unnecessary.**

COUPON

**Franklin Institute**
**Dept. M100, Rochester, N. Y.**

Sirs: Send me, without charge: (1) sample Railway Mail Clerk Examination questions; (2) schedule showing places of all U. S. Government coming examinations; (3) list of other government jobs now open to men and women, and (4) free book describing them.

NAME .....

ADDRESS .....

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# TIRES 1/3 LESS

Perfect, new tires, all sizes, non-skid or plain, fabric or cord. Prepaid on approval. 8000 to

***10,000 Miles Guaranteed***

30,000 Customers. Catalog Free. Agents Wanted.

**Service Auto Equipment Corporation**
**911 Service Bldg., Kansas City, Mo.**

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# 10 Buys 100

Millions Billions in use to-day

# Engel "Art Corners"

NO PASTE NEEDED

**Use them** to mount all kodak pictures, post cards, clippings in albums

Made in Square, Round, Oval, Fancy and Heart of black, gray, sepia, and red gummed paper. Slip them on corners of pictures, then wet and stick. QUICK-EASY-ARTISTIC. No muss, no fuss. At photo supply, drug and stat'y stores. Accept no substitutes; there is nothing as good. 10c brings full pkg. and samples

From Engel Mfg. Co. Dept. 516 1456 Leland Ave., CHICAGO

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# AGENTS $60 WEEKLY

Robinson Folding Bath Tub. Big seller. Costs little, no plumbing, little water. Weight 15 pounds, folds into small roll. Full length baths, far better than on tube. Guaranteed 10 years. $10 a day easily made. Write for free tub offer.

ROBINSON CABINET MFG. CO 4954 Osterlee Bldg., Toledo, Ohio

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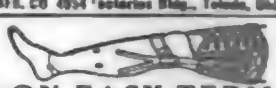
# FIBRE LEGS ARMS



**4-LB. FIBRE LEGS—ON EASY TERMS**

Orthopedic braces for all deformities. Send for booklet.

MINNEAPOLIS ARTIFICIAL LIMB CO., 636 Dean Bldg., MINNEAPOLIS, MINN.

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**Stop!** Don't flirt with death. Use Mystic Cloth—a rub a day keeps danger away. Absolutely harmless.

# AGENTS—Make $60 Every Week

selling new invention for autos, street cars, locomotives.

## WONDERFUL MYSTIC WINDSHIELD CLOTH

Works like magic. One rub over rain or snow-blurred windshield, presto! glass stays **clear 24 hours.** Can't blur. Prevents accidents, saves time, money, worry. Greatest safety first accessory ever invented—fastest seller—30,000 first month. Every car owner, motorman, engineer buys on sight. Endorsed by railroads. Guaranteed one year. Agents amazed—getting rich. Lester Trippe made $117 in 3 days. Early $128 first week—Chase sold 5000—Vanpelt writes: "A deaf, dumb and blind man could sell it." Hundreds like these. You can do as well. Failure impossible. EXPERIENCE UNNECESSARY. Sells itself—you take orders—that's all. Big selling season now on. Investigate. Exclusive territory. Big profits. Write quick for details—worth fortune—ALL FREE.

**SECURITY MFG. CO., Dept. 187, TOLEDO, OHIO**

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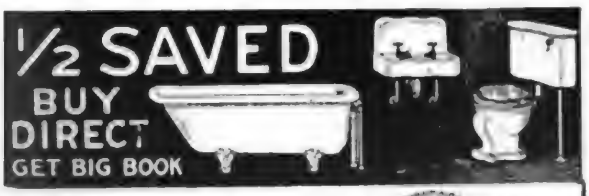



## Do Your Own Plumbing and Heating at Low Cost

Any handy man can install a complete plumbing or heating plant in his own home by our new easy method. Every part comes Cut-to-Fit your needs. Our Engineers draw your plans. You can easily do the rest with a few simple tools. You save time, labor and unused materials.

SEND FOR

## Handy Man Book

This big book tells you what to install and how to install it. It shows over 10,000 different fixtures at wholesale prices. Every builder, home owner, carpenter or contractor needs one. Save the high cost of labor on needed improvements.

We have spared no time or expense in the preparation of this valuable book. To keep from sending it broadcast to uninterested persons we request a temporary deposit of 25c which will be refunded on your first order. Send for it today.

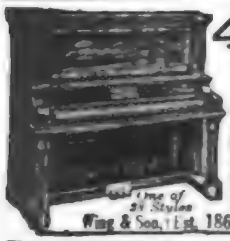
## BURN LESS COAL

and heat the whole house with an improved all-cast pipeless furnace. No expensive pipes or heating equipment. Makes mussy, unsightly stoves unnecessary. Costs no more than a stove. Can be installed in a day by anyone. They are described at wholesale prices in The Handy Man Book. *Send for it today.*

## HARDIN-LAVIN CO.

**4547-57R Cottage Grove Ave., Chicago, Ill.**

*We Guarantee Our Every Product*



## 4 Weeks' Trial

*Any Superb* Wing Piano or Player Piano, choice of 38 styles, on 4 weeks' absolutely free trial. No money down, all freight prepaid. Return *at our expense*, or keep it at the rock-bottom factory price. Easy terms.

**Valuable Book FREE.** Write today for "The Book of Complete Information About Pianos." Also Free Catalog and Best of hundreds of Wing owners near You.

Wing & Son, (Est. 1868) 9th Ave. and 13th St., Dept. 1189, New York

## $3.00 Brings This SUIT

## Tailored To Your Measure

on an offer so easy, so liberal, so wonderful, you can hardly believe it. The very latest 1919 style, a perfect fit, magnificent new design, *delivered prepaid.* **Send no money now, not one cent,** just write us a letter or postal and say, **"Send me your new amazing $3 suit offer"** and get the latest big set of cloth samples to pick from, a great book of all the brand new 1919 fashions shown in gorgeous colors, **all FREE,** an offer so splendid, so marvelous it's hard to believe; greater and better than you expect. **How to get all your own clothes free,** how to make all your spending money in your extra spare time, how to become more important, influential and prosperous. Don't wait, don't put it off, write us your name and address now, today, this very minute. Address **BANNER TAILORING CO., Dept. 417, Chicago**

*Please Mention Popular Mechanics*

# When Johnny has the Croup!

That's a cough with a croupy rattle, so hurry for the Musterole and rub it in right over the chest and neck. How it will tingle at first and then grow ever so cool. And how it will reach in and penetrate right to the spot! It will dissipate all the stuffy congestion which causes that hacking cough.

Why ***shouldn't*** grandmother swear by Musterole for colds and coughs? It is better than a mustard plaster—good as ***that*** was in the old days. And the explanation is this:

Musterole is made of oil of mustard and other home simples. It penetrates under the skin, down to the part. Here it generates its own heat, and this heat disperses the congestion. Yet Musterole will not blister. Musterole, on the contrary, feels delightfully cool a few seconds after you apply it.

Try Musterole for Bobby and Helen and Dorothy's croup—and for your own cough, too. Try it for rheumatism—it's a regular rouser out of all congestions. Always keep a jar handy.

Many doctors and nurses recommend Musterole. 30c and 60c jars. $2.50 hospital size.

The Musterole Co., Cleveland, Ohio

***Better Than a Mustard Plaster***

MUSTEROLE

WILL NOT BLISTER

REG. U.S. PAT. OFF.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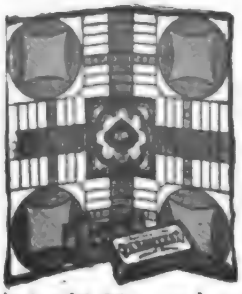
# GAMES FOR CHRISTMAS



## PARCHEESI

A game that will never grow old. Remember how you used to hold a block so long and you were nearly all the way round when you were sent home? The same thrill is still there. You had better get a game and teach the youngsters how to play.

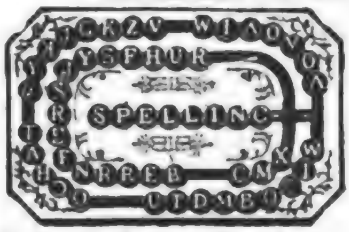
Price $1.00 complete

## PLANCHETTE

The most fascinating and mysterious game sold. A revealer of the past, future and present. Interesting and bewildering. A game that any number can play at.

Price 50 cents each.

## SPELLING BOARD



Instruction and play at the same time for the young ones. A durable beautifully enameled board, 9½x13½ inches long. Letters cannot be lost or broken like blocks, etc. Will amuse youngsters for hours. **Price $1.00 complete.**

## TA-BEL POOL

Fun for the whole family. Not a toy, but a practical table game. 3½x5 ft. Complete set pool balls numbered, triangle frame, 4 cues; 36 inches long. Compares favorably with much more expensive ones. **Price $12.00 complete.**

*For Sale by Toy and Department Stores or sent postpaid by*

**SELCHOW & RIGHTER CO., 620 Broadway, New York**

**$1.00 DOWN**

**BRINGS YOU THESE TWO FINE SHIRTS**

The latest thing in a semi-dress shirt everybody's wearing them for business, work, and sport. They're easily worth $4 each—try to match them in any store at that price! Our price for the two is only $5.75—at least $2 saved.

**CADILLAC BROADCLOTH FLANNEL SHIRTS**

Made of fine quality, long wearing Cadillac Broadcloth Gray Flannel. Special Winter weight. Coat front style, **cut extra full.** Two extra large button-down-flap pockets, faced sleeves and matched pearl buttons. Double-stitched throughout. Soft turn-down attached collar with sateen faced neckband. Goods **thoroughly shrunk.**

**Send Only $1.00** Write today, enclosing only $1.00. Shirts will be sent at once, transportation prepaid. Pay balance of $4.75 on arrival—no more. We will return your money at once if you are not entirely satisfied. Be sure to state neckband size.

**BERNARD-HEWITT & CO.** Desk FS-2012, 430 S. Green St. **CHICAGO**



**WIRELESS BAN IS OFF**

**GET E. E. BUCHER'S NEWEST BOOK WIRELESS EXPERIMENTERS MANUAL**

UP-TO-DATE CONSTRUCTION OF ALL APPARATUS

**PRICE $1.75**

**SPECIAL! SAVE 50c** With Year's Subscription to the WIRELESS AGE only **$3.25**

WIRELESS PRESS, 1367 Woolworth Bldg., New York

Ask for Our New Catalog



SEND for your free copy of folder on Wet-proof Shotshells — absolutely waterproof. The Remington Arms UMC Co., Inc. Woolworth Bldg., New York.



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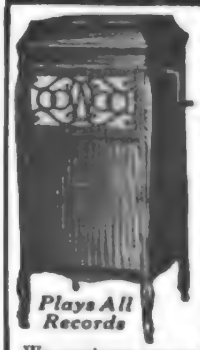
**Save Half**




Be the first in your neighborhood to get regular dealer's offer. Buy direct and save half. This is our way of introducing the wonderful Cadillac Supreme Phonograph. Mahogany or Oak, fifty inches tall. Guaranteed.

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Return if not satisfied. You risk nothing. We include ten Victor and Columbia Record Selections Free.

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We want one person in each locality to whom we can refer customers. Help advertise the Cadillac and get your own free. Write quick for wholesale price, free trial offer, and learn how you can get one free. **Agents Wanted**

**CADILLAC PHONOGRAPH CORPORATION**
1615 Carroll Avenue, CHICAGO, ILL.


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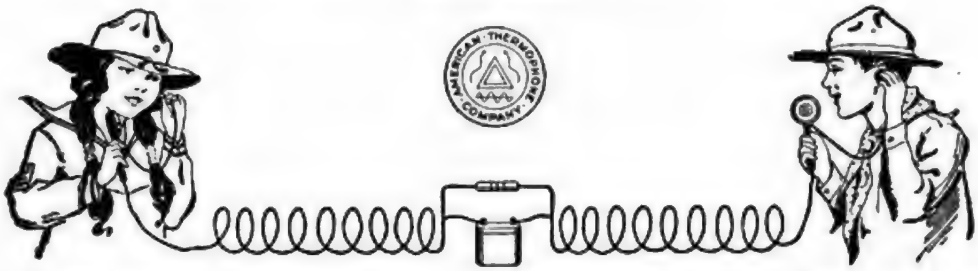
# KIDPHONE

TRADE MARK




## BOYS! GIRLS!! GROWN-UPS!!!

The "Kidphone" is sold as a toy, but it is more than a toy, it is a practical, durable, superior telephone. Altho it is much smaller and weighs much less (receiver weighs ¼ ounce) it talks better than the one you're used to. The idea of operation is different, it is based upon the correct theory of voice transmission, introducing to America for the first time a far-reaching scientific principle, only recently perfected. Can be used for all sorts of purposes—in the house, in the play-room, on Scout duty, in games, etc.

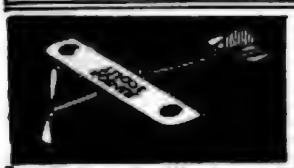
**Ingenious! Instructive! Fascinating!**

**An All Year 'Round Christmas Present**

***Price $10, at Your Electrical Dealer's, Department Store, or From Us Direct.***

Dept. A

**American Thermophone Company, 114-116 Bedford St., Boston, Mass.**



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Own a "Junior Scout" Monoplane. A scientific flying toy unequaled. Flies in a big circle assuming a horizontal position at all times, the propeller turning rapidly. Dips and dives at will. A real toy for a real boy. Sample, 50c postpaid. 3 for $1.00. Coin or Money Order. No Stamps.

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**Scientific Construction Cuts Building Costs**

Send today for the 1920 Book De Luxe of Sterling homes. Beautiful bungalows, modest cottages—designed by leading architects—all attractively illustrated in this wonderful book.

***Sterling System Homes***

are the result of scientific construction applied to home building. You can save money by the Sterling System because it eliminates waste, cost of handling, and the old "hand-saw methods". Send 10c today for the 1920 Book De Luxe and see for yourself the tremendous savings of the Sterling System.

**The International Mill and Timber Co.**

Dept. 1359 BAY CITY, MICH.

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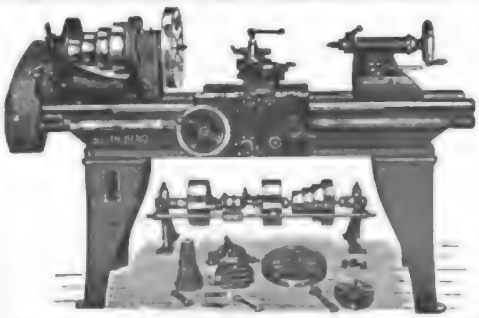
*Please Mention Popular Mechanics*



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## For the Machine and Repair Shops

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| 13" Lathe . . . | $325.00 | 18" Lathe . . . | $ 700.00 |
| 15" " . . . | 420.00 | 21" " . . . | 900.00 |
| 16" " . . . | 500.00 | 24" " . . . | 1250.00 |

Made with straight or gap bed. Price includes equipment as shown in illustration. **South Bend Lathes have been on the market thirteen years. Over 21,000 in use.** EST. 1906.

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**How to Run a Lathe** An 80-page book, postpaid to any address for ten cents, silver or stamps accepted.

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A tight joint is a tribute to clean-cut threads. You will find well-fitting joints on every job that OSTER BULL-DOG Die-Stocks tackle. No. 102, shown here, threads six pipe sizes, ¼, ⅜, ½, ¾, 1 and 1¼ inches.

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# SEBASTIAN

10-13-15 Inch Swing—
Gap or Straight Bed.

Medium Priced Good Lathes for 30 Years.

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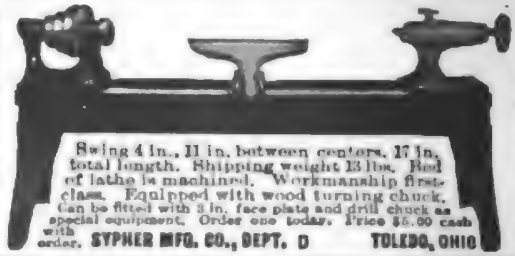

EXACTLY LIKE PICTURE

Swing 4 in., 11 in. between centers, 17 in. total length. Shipping weight 13 lbs. Bed of lathe is machined. Workmanship first-class. Equipped with wood turning chuck. Can be fitted with 3 in. face plate and drill chuck as special equipment. Order one today. Price $6.00 cash with order. SYPHER MFG. CO., DEPT. D TOLEDO, OHIO

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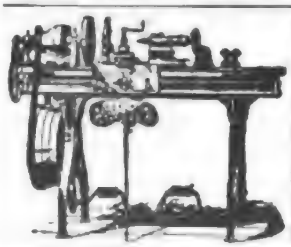

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**9 to 18-inch Swing**

List price $100 and up according to size. When ready to buy send for Lathe Catalog and prices.

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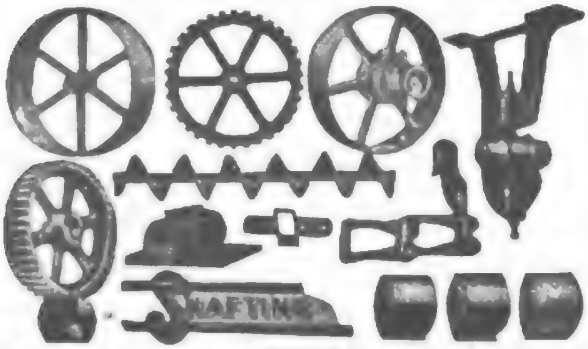


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W. A. JONES FOUNDRY & MACHINE COMPANY
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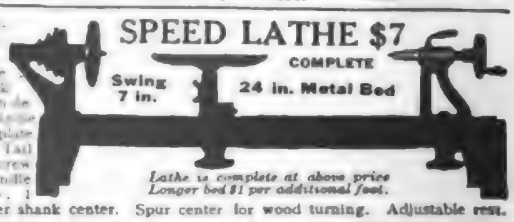


Head has 3-speed cone Spindle, No. 1 Morse taper shank, centers 24 in. de... through splasher ...ish. Tool plate furnished. Tail stock has screw feed spindle and No. 1 Morse taper shank center. Spur center for wood turning. Adjustable rest.

*Lathe is complete at above price. Longer bed $1 per additional foot.*

M. & J. SPECIALTY CO., 252 South Parke St., PONTIAC, MICH.

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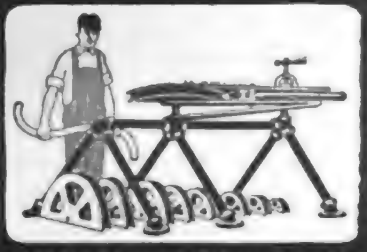

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Three New Models

"Wonder" Pipe Bending Machines (pat.) electrically operated to bend from 1 inch to 18 inch. Send for printed matter.

*We also manufacture TEN other sizes, hand operated to bend from ⅛ inch to 8 inch.*

**American Pipe Bending Machine Co.**
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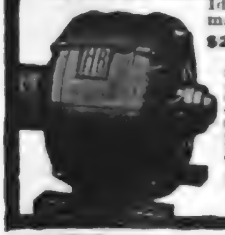
HB Ball Bearing Electric Motors save greatly on operating cost. More economical, more dependable, better in every way than gas engine. Trouble proof, built for heavy duty. Ideal power for factory, garage and machine shop.



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**Sizes 1 to 15 h. p. A Size to Meet Your Needs.**

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*Successful Manufacturers Since 1893*

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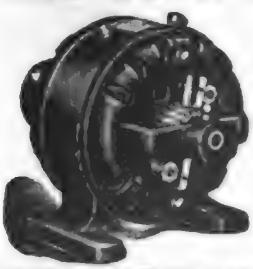

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is steadily increasing in popularity because the machines always satisfy users who want the better class of equipment. Send today for catalog of hand saws, jointers, saw tables, planers, planers and matchers, disk grinders, swing saws, post borers, shapers, variety wood workers, hollow chisel mortiser, universal wood workers, table cut off saws.

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A place for every tool and each tool in its place. Prevents rust, misplacing or borrowing. Strongly made, beautiful finish, double lock, corner joints. Many styles and sizes.

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A Practical, Safe, Easy-To-Use, Low-Priced, One-Man Outfit for

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| **Farmers** | **Shingle Mills** | **Loggers** |
| **Timber Men** | **Stave Makers** | **Wood Cutters** |
| **Contractors** | **Box Makers** | **Ice Packers** |

and a handy money-making outfit for the man who has timber land to clear. Easy to operate on any size or kind of log. **Shipped anywhere, complete, with saw, ready for work.**

### DIRECT FROM FACTORY

You buy direct from WITTE—you get quick shipment. You get a complete power plant for log sawing or ice sawing. Engine is 4-cycle WITTE, water cooled. High-speed gear drive. Arm Swing Lever operates saw 180 strokes per minute. No chains or belts—Friction clutch, operated by hand lever, instantly starts and stops saw while engine is running. Starts saw at slow speed or full speed. Clutch works automatically if saw pinches. Reversible wheels. Can be hauled or pushed anywhere. Rig should pay for itself in **10** days. Big **3-color** folder tells all about the **"Arm Swing"** and other exclusive WITTE improvements. Before you decide on any saw outfit or engine—**"WRITE to WITTE."**

GET WITTE PRICES AND SAVE MONEY.

**WITTE ENGINE WORKS**

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NOT the washing machine type or intermittent duty. No factory seconds or discontinued models but the latest type of motor made.

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| 32 volt D. C. | $22 |
| 110 volt D. C. | 28 |
| 110 volt A. C.—60 cycle single phase | 20 |

**SPECIAL OFFER** We will prepay transportation charges anywhere in the U. S. on the above motors. Remittance must accompany order. We sell electrical supplies, rebuilt motors and generators in all sizes. **Satisfaction guaranteed or money refunded.**

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**This is Your Opportunity to buy new, guaranteed Electrical Apparatus of Standard Manufacture**

Battery Charging Outfits

For use on 110 volt A. C. 60 cycle, single phase current only

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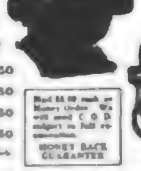
| 180 watts, 12 volts, 15 amperes | $68.50 |
| 660 watts, 30 volts, 22 amperes | $94.50 |

All outfits complete with switch board as per above.



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ALL MOTORS COMPLETE AS CUT

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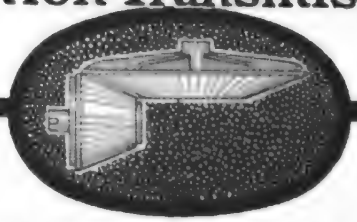
## Friction Transmission



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Rockwood Friction Transmission is truly an economical drive. It operates with constant, high efficiency—transmits power with least loss—cuts out noise, and gives the machine on which it is used an unlimited speed range.

Able to start instantly, accelerate with great speed, and to stop suddenly. No stripping of gears. No jerking in starting or stopping.

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It is standard equipment on thousands of constant and variable speed machines—saving power and upkeep cost. What it is doing for others it can do for you. Investigate Rockwood Friction Transmission today.

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Send today for this big, valuable book, "Friction Transmission." Full of helpful data.

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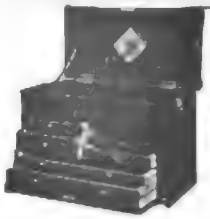
QUALITY ABRASIVES that are entering American factories everywhere. Write for booklet telling many curious facts about them. Manning Abrasive Co., Inc., Troy, N.Y.



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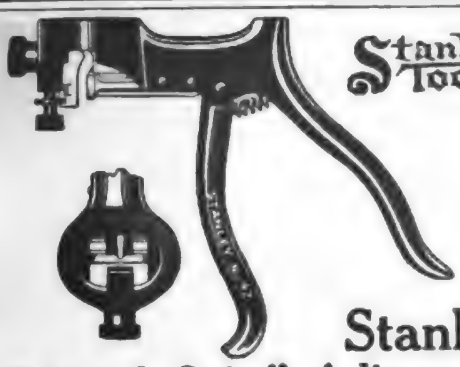

Stanley Tools

## Stanley "Pistol Grip" Adjustable Saw Set No. 42

**This Saw Set embodies several unique and important features not heretofore seen in tools of this description.**

The shape of the Body and Handle enables the user to operate the tool with great ease and with the least possible exertion, and the saw is held firmly against the gauge while the tooth is being set.

It can be readily adjusted by means of the knurled thumb screw to give a greater or less set to the teeth of the saw, according as the saw is to be used for coarse or fine work. As the anvil or part against which the plunger works is graduated, the same adjustment can be easily obtained for duplicate work.

The tool is so designed that the saw teeth are in plain view which enables the user to quickly adjust the tool to the tooth to be set.

The plunger and anvil are made of tool steel—hardened and tempered. All parts are carefully **machined** and are **interchangeable.** The tool is given a fine black finish.

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The original KON-VER-TER SLIDE rule has over 6000 graduations and over 1800 letters and figures, will handle anything in arithmetic, Algebra, Geometry or Trig. Is 5-4 inches in diameter and in use all over the world, is much simpler to operate than others of similar construction. Eventually you will get the KON-VER-TER—get it now and save money. Plain utility rules $1.00. Special DeLuxe WHITE ivory celluloid $2.50. Leatherette cases $0.50 extra.

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**LOCKS and HARDWARE**
*Solid Quality*
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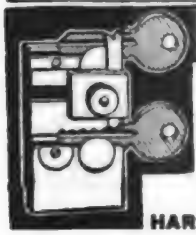

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Your tool kit should contain enough tools to meet your every day requirements so that you can work accurately and quickly, these two points are the basis for promotion in practically every shop.

A well made reliable micrometer is an actual necessity. Its uses are unlimited. It should be in every kit.

Another practical tool is the combination square. In laying out a drill job or squaring up a piece it is of great help.

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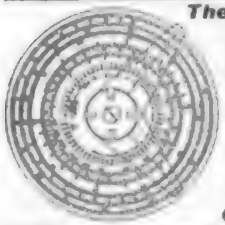

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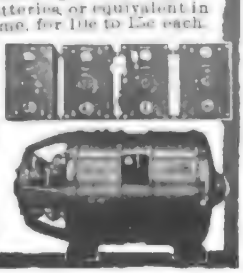

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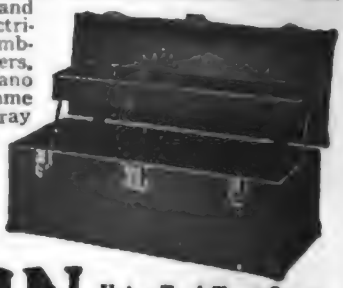
Quartered Oak or Leather Covered, designed for auto mechanics, garage and home use, masons, electricians, mechanics, plumbers, fishermen, painters, repairmen, linemen, piano tuners. Kiln-dried. Frame joints *lock-cornered.* Tray with movable partitions that *automatically* raise when chest is opened. Special Lock—*twelve key changes.*



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**UNION** TOOL CHESTS

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# WIRE

electrical, rope, airplane, piano, pipe-organ, flat, hoops, bale-ties, tacks, nails, barbed-wire, concrete re-inforcement, springs, netting, wire fences, steel posts, trolley-road wires and rail bonds, wire wheels, auto-towing cables, horse-shoes.

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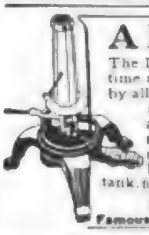

## A Blast Without a Blower

The Lane Burner brings cherry red for hardening in one-third time required by Bunsen. Pays for itself in day's use. Adopted by all advanced shops. Necessity where quick, intense heat is needed. Invaluable for hardening, soldering, brazing, annealing, tempering, melting; experimental laboratory, research work. Butterfly Valve regulates heat from moderate to blast of more than 2000 degrees. Shut-off Valve. Ever Ready Pilot, gas connector that stays connected. Tight gas tank, fixed connection on number. Descriptive circular and prices on request.

**LANE MANUFACTURING COMPANY, Inc.** Famous Lane Burners 21 Vose Ave., SOUTH ORANGE, N. J.

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By ONE MAN

**It's KING OF THE WOODS. Saves money and backache.** Send for **FREE** catalog No. B115, showing low price and latest improvements. First order gets agency.

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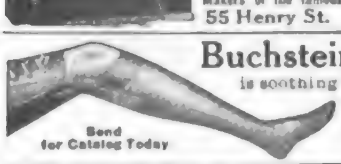

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities.

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**BARTLETT DROP-FORGED Compound Lever SNIPS $2 to $6**

Made of high-grade Crucible Tool Steel, accurately tempered. Cuts metal up to 18 gauge easily. 7 inch size just right for household use.

7-inch, stamped, $2.00
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Your dealer has them or can get them from his jobber. If he will not we will ship prepaid in U. S. at above prices.

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## TREMENDOUS SAVING IN COST

You don't need to be a cabinet maker. We have made it an easy and a pleasant job with

**Our Simplified Plans** We furnish blue prints, diagrams, motor, ready-built horn, cabinet pieces and all metal parts complete. You do the assembling, **6 models to choose from.** A few hours' work, and you will have as fine a type of phonograph as any produced, and at a price away below what you would pay in a store.

**Keep the Savings in Your Pocket**

Machines play all records, have a wonderful tonal quality, excelled by none. No need now for any family to be without a phonograph because of the cost. THE MAKAFONE solves the problem. BUILD IT YOURSELF AT LESS THAN ONE-FOURTH REGULAR COST, but equal to the high priced cabinet machines. Free Records with each outfit. SEND TODAY FOR FREE CATALOG and full particulars of our wonderful offer. *Many a manufacturer got his start in this way. Why not you? Build machines and sell to your friends. Ask us about this.*

**AGENTS ATTENTION**

You can make and sell this machine from our plans at a profit of $50 to $75 each. Others are selling two and three a week. Here is your opportunity to make big money and become independent. Pleasant and profitable work. START TODAY.

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Gentlemen: Please send me full particulars of your Makafone proposition, without obligation to me.

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**DYES** 25 different colors for dyeing cotton, wood, silk, etc. Material sufficient for dyeing scores of skeins. Set includes five wool and cotton skeins, two dyeing chemicals and spoon measure. Neatly packed. Sent postpaid for $4.50.

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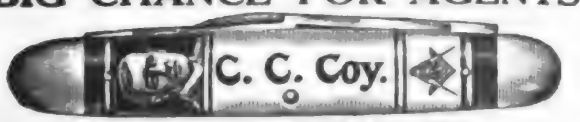


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selling the most complete line of guaranteed transparent handle Knives and Razors with Photo, Name and Lodge Emblem — also full line of cutlery. Write today for catalogue and terms.

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**ADVERTISING SCHEMES PAY BIG**

**12** 12 high class practical new propositions. Full details and plans for soliciting and selling. Any one of which may net you from $20 to $100 a month. Any live hustler can make big money with these ideas. Satisfaction guaranteed **$1**

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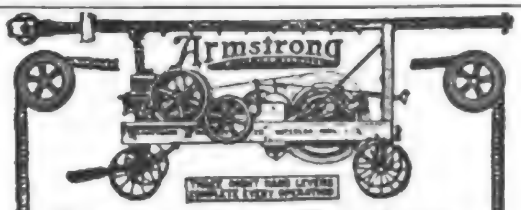


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drill more hole at less cost than any machine on the market. The ARMSTRONG—built for service since 1867—furnished in traction or non-traction style — operated by our famous special kerosene drilling engine.

The **Armstrong Drill** is a marvel of simplicity, efficiency and durability. 3 right hand levers complete every operation. Many beginners average 50 ft. per day. On hard tests it has averaged 92 ft. per day through solid rock, using only 6¼ gals. fuel—figure the profit possibilities out for yourself. Get full information. Special consideration to men returning from Service.

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*Please Mention Popular Mechanics*

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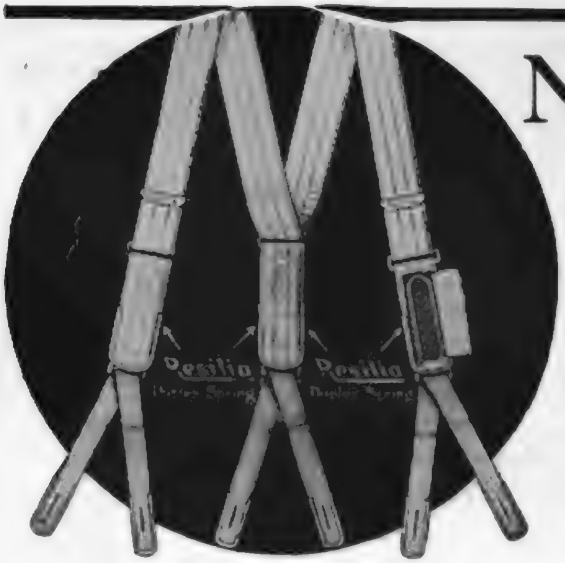


Neither wear, perspiration nor weather conditions affect the elasticity of

the resilient

# Resilia NO RUBBER SUSPENDER

*Reg. U. S. Patent Office and Foreign Countries.*

RESILIA FABRIC is high-grade, closely woven and contains no rubber. The metal fittings are of special composition that will not rust or tarnish.

THE COMFORT OF RESILIA is a revelation, elasticity being in three responsive, ever-active RESILIA DUPLEX SPRINGS concealed in the webbing that give with every move you make—that work smoothly and freely at all times—under all conditions—that eliminate shoulder strain and safeguard buttons.

A MONEY-BACK GUARANTEE of satisfaction is attached to every pair of Resilia No Rubber Suspenders.

IF YOUR DEALER DOES NOT SELL RESILIA, send us his name and $1.00, money order or check, and a pair will be forwarded by prepaid mail. Wear 30 days—then if not fully satisfied, return to us and money will be refunded. Please state whether 36 or 39 inch length is desired.

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## The Pictograph
### Moving Picture Machine

With three standard films enclosed in can. Film, cement, brush, and admission tickets, all complete. Operated from electric socket.

*For sale by leading toy and department stores or sent prepaid on receipt of* **$7.50**

All metal throughout. Heavy base casting.

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**"The Samson No. 3 Bench Punch,"** with a powerful leverage of 24 to 1, is intended for work beyond the capacity of the **"Samson Hand Punches,"** and will punch holes from ⅛ to ⅜ in. in soft metal up to 12 Gauge. Extra sets punches and dies size ⅛, ¼, ¼, ⅜, and ⅜ in. easily inserted and removed, (maximum punching capacity ⅜" through 12 gauge soft metal.)

***Equipped with 3-16-inch Punch and Die unless Otherwise Specified***

**Price $12.50 Delivered**

*Catalog of Complete Line Sent on Request.*

**The Machine Appliance Corporation**

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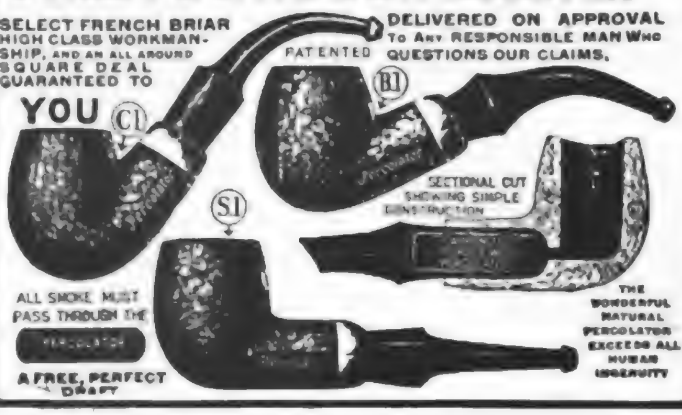
## THIS PIPE ITS OWN BOOSTER

SELECT FRENCH BRIAR HIGH CLASS WORKMANSHIP, AND AN ALL AROUND SQUARE DEAL GUARANTEED TO YOU

DELIVERED ON APPROVAL To Any RESPONSIBLE MAN Who QUESTIONS OUR CLAIMS.

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Is Delivered On **APPROVAL Subject to 3 days Trial** Whether to a Purchaser of **Approved Credit**, or for Cash With Order: It **Must** Prove the **BEST** Smoking Pipe the Purchaser Ever owned, or His advanced payment **Will be Refunded** upon Request and return of pipe. The Approved Credit customer either Remits or returns the pipe. That's Our Pipe Story In a Nut-Shell. It's the Smoker and Pipe for the rest.

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**ALL PERCOLATOR PIPE BOWLS** are ELECTRICALLY CARBONIZED Which means that they are Fully 90% Broken In, and Positively **GUARANTEED** Against Burning Through. Full Particulars Given in Illustrated Pamphlet Forwarded upon Request. THE MODELS SHOWN Herewith Represent Three very desirable "Happy Medium" Size, Shape and Weight Pipes, of SELECTED FRENCH BRIAR; Solid Rubber Stem; Sterling Silver Band, Rich Nickel Finish; Length 5½ in. Wt., 1¾ to 1⅞ ozs. Price $2.50 each Including Box of 10 Carbonized Percolators. Postpaid in the U. S. 25c Additional for Foreign Registry.

**THE PERCOLATOR PIPE CO.**

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# Build Your Own PHONOGRAPH

## IT'S EASY WITH OUR HELP

A few hours' interesting work saves many dollars—gives you a fine machine exactly to suit your ideals—better than many machines costing much more. Plays any record.

We furnish complete, simple plans and diagrams—anyone can understand them—motors, tone arms, case material, everything required, and full instructions.

F. C. Strong, Canada, says: "Please send me one of your circulars, 'How to Build Your Own Phonograph,' as I would like to make one. Mr. Gallie has built one and if he hadn't told me that he had made it himself I would have taken it for a $150 model."

Listen to this from Charles F. Mancke, Wash.: "Received the two outfits, and am well pleased. I built one machine for myself and took an order for one for $175. I now have mine done, and it has a wonderful tone. I would not take $200 for it."

We are the originators of the home building idea. Our customers always succeed because our plans and system are easy and clear. No special skill necessary.

**Get Our FREE Blue Print Offer**

**DEALERS WANTED FOR OUR Ready Built Phonographs**

**SAVE OVER HALF**

## Make Big Money Building Phonographs

***Ask for Our Sure-Fire Plan and Free Blue Print Offer***

You can make hundreds of dollars easily. Ask us. We tell you how and help you. We have started many others. We can start you. Pleasant, easy work. N. J. Adams, Michigan, says: "Just sold my phonograph which I built from your plans and parts at nearly $100 profit. Only took about a week working evenings to build it. Those who have heard it say that it is better than phonographs they have seen and heard at $200."

### Become a Home Dealer — Wonderful Plan

Our dealers' proposition on our ready built Phonograph will appeal to you. It's the best thing yet. No canvassing—no work—no capital needed. It works every time. We give you full particulars and show you how to make sure, easy money.

Remember, we are the old reliable house-originators of the home building and home dealers idea. Write today. Get our proposition. Have a fine phonograph at half price and make money besides.

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## Health? Take Turkish Bath at Home—Only 2 Cents

Physicians are abandoning drugs for this new treatment. If your mind or body is tired, open your pores and feel the rapid change in your condition, at cost of 2c a bath. The Robinson Bath Cabinet is the only scientifically constructed bath cabinet ever made for the home. Great $2 Book Sent Free—"The Philosophy of Health and Beauty." Write today. Agents Wanted.

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on rebuilt at the factory by the well-known "Young Process." Sold for low cash installment or rented. Rental applies on purchase price. Write for full details and guarantee. Free trial.

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## KOR-KER PRESERVES TIRES

**Gives 50% More Mileage**

Seals punctures instantly. Stops slow leaks. Preserves rubber. Keeps tires fully inflated. Thousands of users in 40 countries for 7 years.

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## Wear Absolutely Waterproof Steels

Cost less than leather, wear 3 to 6 times longer, are lighter, easier, stronger. Stop big shoe bills. Eliminate repair bills. Stop foot troubles. Prevent Colds, Rheumatism, Corns, Bunions. Keep feet warm and dry in snow, rain, mud, slush. Never change shape—comfortable always. **FREE Shoe Book Tells All. Write Today**

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**STEEL SOLE SHOE CO., Dept. A37, Racine, Wis.**

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## GENUINE DIAMONDS

## ½ CARAT PURE WHITE $33

Wonderful value in Ladies' or Men's 14k solid gold ring. Positively genuine diamond. Looks like $100 stone because of large spread. Remarkable color—brilliant, snappy. Accurately cut. Price astonishingly low. Biggest bargain you have ever seen. **Your money refunded if you can duplicate our offer at double our price.** Written legal guarantee covers weight, quality and value.

***Order from this ad*** —You run no risk—everything exactly as represented. **You can wear any of our diamonds a year and return it and get your money back.** Sent on approval if desired. Absolute satisfaction guaranteed—always. 40 years' honorable dealings back up our statements. Order now—diamonds are a good, **safe investment**—constantly advancing—10% to 20% increase expected soon. Save money—**Order today!**

***Send for bargain catalog*** —Full of surprises. Thousands of diamonds, rings, watches and other jewelry offers at most remarkable cut prices. Get it—**it's free.**

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**(Est. 1879) 170 Nassau St., Div. 24, NEW YORK, N. Y.**

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# Last Big Block
## of the Canadian Pacific Reserved Farm Lands

THIS announces the offering of the last big block of the Canadian Pacific Reserved Farm Lands. Until this block is disposed of you can secure at low cost a farm home in Western Canada that will make you rich and independent. Never again on the American Continent will farm lands be offered at prices so low.

## Last Big Opportunity

This block contains both fertile, open prairie and rich park lands in Lloydminster and Battleford Districts of Central Alberta and Saskatchewan. Farm Lands on the rich prairies of Manitoba, Saskatchewan and Alberta are $11 to $30 an acre. Lands in Southern Alberta under an irrigation system of unfailing water from $50 an acre up.

## Twenty Years to Pay

The Canadian Pacific offers you this land under a plan of long term, easy payments that is remarkable in the history of farm investments. You pay down 10%. Then you have no payment on the principal until the end of the fourth year, then fifteen annual payments. Interest is 6%. In Central Saskatchewan, Seagar Wheeler grew the world's prize wheat. World's prize oats were grown at Lloydminster.

## Lands Under Irrigation

In Southern Alberta, the Canadian Pacific Railway has developed the largest individual irrigation undertaking on the American Continent. This district contains some of the best lands in Canada. An unfailing supply of water is administered under the Canadian Government. Prices range from $50 an acre up on the same easy payment terms.

## Special Rates for Homeseekers and Full Information

The Canadian Pacific will not sell you a farm until you have inspected it. To make this easy, special railway rates have been arranged. Do not delay your investigation. This is the last great block of Canadian Pacific Reserved Farm Homes. Send today for complete information — without obligation.

M. E. THORNTON
Supt. of Colonization

**Canadian Pacific Railway**
**966 First St., E., Calgary, Alberta**
*For all information about Canada ask the C. P. R.*

*Please Mention Popular Mechanics*

# 1 Year's Use For NOTHING

# ½ CARAT PURE WHITE $33

Wonderful value in Ladies' or Men's 14k solid gold ring. Positively genuine diamond. Looks like $100 stone because of large spread. Remarkable color—brilliant, snappy. Accurately cut. Price astonishingly low. Biggest bargain you have ever seen. **Your money refunded if you can duplicate our offer at double our price.** Written legal guarantee covers weight, quality and value. ***Order from this ad*** — You run no risk—everything exactly as represented. **You can wear any of our diamonds a year and return it and get your money back.** Sent on approval if desired. Absolute satisfaction guaranteed—always. 40 years' honorable dealings back up our statements. Order now—diamonds are a good, **safe investment**—constantly advancing—10% to 20% increase expected soon. Save money—**Order today!** ***Send for bargain catalog 28*** — Full of surprises. Thousands of diamonds, rings, watches and other jewelry offers at most remarkable cut prices. Get it—it's free.

**B. GUTTER & SONS, Wholesale Jewelers**
**(Est. 1879) 170 Nassau St., Div. 28, NEW YORK, N. Y.**

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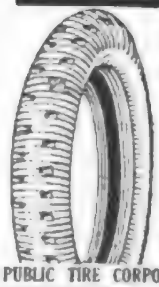

Here is your chance to secure a **Puncture Proof Tube Free** with every Public Tire ordered. Public Tires are reconstructed and guaranteed 5000 Miles.

**PRICE INCLUDES TUBES AND TIRES**

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|---|---|---|---|
| 28x3 | $6.90 | 34x4 | $11.40 |
| 30x3 | 7.30 | 34x4½ | 13.05 |
| 30x3½ | 8.40 | 35x4½ | 13.30 |
| 32x3½ | 9.00 | 36x4½ | 13.80 |
| 31x4 | 10.25 | 35x5 | 14.55 |
| 32x4 | 10.60 | 36x5 | 14.80 |
| 33x4 | 11.05 | 37x5 | 14.95 |

In ordering state whether S.S., cl., plain tread or non-skid. Send $2 deposit for each tire, bal. C.O.D. subject to examination. 5 per ct. cash disc. if full amount sent with order.

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# Free Shoe Book Saves You $20

More than a million satisfied customers named our shoes "The World's Greatest." Don't think of buying **any** shoes until you get our 1920 shoe book. It shows the most complete line of lasts, styles and leathers for every purpose, no matter what your requirement. Saves your health and money. **Free 10-day try-on.**

**100 Shoe Bargains** **For Men, Women, Boys and Girls**

*Also complete line Ruthstein's Famous Absolutely Waterproof Steel Shoes.* Big, new, 1920 Scientific Footwear Catalog shows over 100 styles and how to save 20 to 50 per cent on shoes for the whole family FREE on request.

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***You Can Build It***

Send a quarter for drawing, description, instructions, and price list of parts. They make it easy.

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Most unique designs in distinctive Jewelry. Special offerings in beautifully set gems, fully illustrated in this book. Send postcard.

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# SOLDERALL

25c PER TUBE

A PASTE THAT TURNS INTO METAL WHEN HEATED

USED IN WAR BY UNITED STATES AND ALLIED GOVERNMENTS

TORCH $1.25

A match will do it. Requires no acid or soldering iron. Joins or repairs wires, metals, or metalware.

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Tube and Torch complete
In Leatherette Case

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It has been proven that this school will give you the necessary practical training to qualify for highly paid salaries in any of the following courses.

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**SCHOOL OF ENGINEERING**
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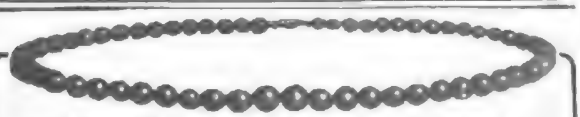

Beautiful green 21-inch Japanese Jade Necklace. Not one in 100 can tell it from the $1,200.00 Chinese Jade Necklace. If you want the "very latest" for a lady, send $5.00 today. Bracelets $2.00. *Money back upon examination if not satisfactory.*

**BRENNEMAN & CO., Hammond, Indiana**

Sanitary "O.K." Erasers

Just the thing for Particular People. Always clean.

They Erase
—Ask Your Stationer

**Metal Holder Keeps Rubber Clean, Firm and Keen-Edged. Works Better—Lasts Longer**

Two Rubbers, the length of the Holder, are made, one for Ink, one for Pencil. By slight pressure, clean Rubber is fed down as used. Prices 15 cents; Fifteen for 50c; per dozen $1.00. "O.K." Booklets FREE.

**Adjustable Brush to fit Holder 10c**

The O. K. Mfg. Company, Syracuse, N. Y., U. S. A.
*Makers of Weatherbone Ink Eraser Fasteners & Letter Openers.*

# SHOES FOR ALL THE FAMILY

Send today for our latest shoe catalog. Shows how much at wonderful bargains for men, women, misses, girls, boys and children. All styles—Dress, Work and School Shoes. Best made—Shoes guaranteed to wear 6 months. Save $1 to $3 a pair. Money back if not satisfied. Write postal for your free copy Now, Today.

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**Convenient – Sanitary**

The Comfort Closet for Homes, Factories, Stores, etc. A comfortable, sanitary, indoor toilet entirely protected from cold, stormy weather.

**Invaluable for Women**

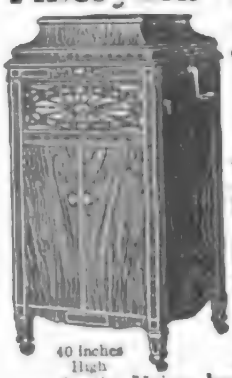
and children in winter. Easily installed in any room. Easily cleaned. Plumbing unnecessary. Only closet with porcelain container.

**Entirely Odorless**

Scientifically ventilated. Contents dissolved by chemicals and easily disposed of. Approved by U. S. Health Bureau and Boards of Health. **30 DAYS FREE TRIAL.** Booklet FREE. Agents make $60 to $100 Weekly. Exclusive territory.

**Comfort Chemical Closet Co., 797 Factories Bldg., Toledo, O**

# Thieryola Phonographs



40 Inches High

# $1.00

As first payment AFTER TEN days use in your home—the balance in little monthly payments until paid.

Most surprising values and terms ever offered on beautiful Mahogany and Oak Cabinet Phonographs—perfectly playing all makes and sizes of disc records.

Thousands of trial orders every month, from every state in the Union, but the supply is limited—and prices and terms must soon advance.

Twelve beautiful and newest selections of music included until further notice with any Thieryola you order without extra charge.

# FREE

## SEND COUPON BELOW

Don't wait! You want music in your home! A Thieryola Phonograph is the complete phonograph—plays all makes of disc records—puts the whole world of phonograph music in your grasp. Fifteen beautiful styles to choose from—in beautiful cabinets of Walnut, Mahogany, Fumed and Golden Oak. And only $1.00 as first payment but you must

## WRITE NOW!

Because prices and terms must soon increase—this offer may be discontinued within thirty days. So mail coupon NOW.

J. B. THIERY
Dept. 5 –Milwaukee, Wisconsin.

Mail postpaid at once color-printed catalog of Thieryola Phonographs and all particulars of your advertised buying plans.

NAME _____

ADDRESS _____

*Please Mention Popular Mechanics*

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# The 21-Jewel Burlington

Adjusted to positions, isochronism and temperature. Newest gold strata cases.

**$3.50 a Month**

Pays for the master watch. Send coupon.

**Send This Coupon**

Burlington Watch Company, Dept. 1359
19th St. and Marshall Blvd., Chicago, Ill.
Canadian Office: 355 Portage Ave., Winnipeg, Man.

Please send me your free watch book and full particulars about your rock-bottom, direct offer on the Burlington Watch, either for cash or $3.50 a month.

*Name* _____

*Address* _____

# Ideal Xmas Gift
## FOR YOUR BOY

## Serviceable "Make UR Own" Flashlight Battery Outfit $1

Easy to make—In 3 minutes. **Instructive, practical, useful**—Every boy should have one. A Xmas gift that any friend would more than appreciate.

## Make Flashlight Batteries

**KNOW THEY ARE FRESH**

Do it yourself and see the mystic charm of making your own light. Have fun doing it. So simple any child can make them. Outfit comes packed in a neat Christmas box. **Fully guaranteed or your money back.** SOMETHING NEW—Nothing like it on the market.

## Better Light—Lasts Longer

400% more flashlight service for less money and your flashlight is always ready when you want it. Fits 1½ x 6½ in tubular flashlight case. Only satisfactory thing to use around house, car, garage, anywhere. Order one of the following outfits today:

Serviceable Flashlight Outfit—Flashlight Case, heavily nickeled, mazda lamp, complete with 6-cell "Make UR Own" battery outfit..... $2.35

Renewal Outfit—Parts and Chemicals to make 6-cells complete..... 1.00

Add 15c to cover postage.

*Attractive Proposition to Agents.*

SERVICEABLE BATTERY AND SUPPLY CO.
**Exclusive Sales Agents**
30 N. Michigan Ave., Dept. 15, CHICAGO, ILL.

# How to buy a pair of pliers

## *2. Cut a nail in two.*

Cut a six penny nail in two with a pair of CEE TEE Co. Pliers. See how clean it cuts—how easily.

Try the same test with any other slip-joint pliers. Chances are you will spring the cutters apart without cutting the nail.

CEE TEE Co. Pliers are dropped forged from special formula steel—and all working parts are accurately milled instead of being merely pressed or die-cut.

*At all good hardware stores.*

CRESCENT TOOL CO.
JAMESTOWN, N. Y.

# Crescent TOOLS



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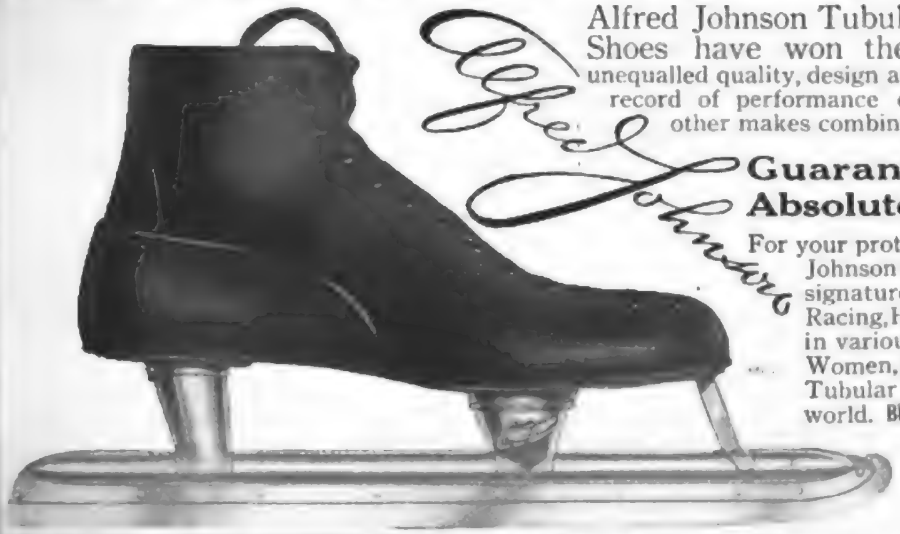
# THE CONSENSUS OF OPINION

*Distributors—Dealers—Skaters—All Agree on One Point—The Absolute Superiority of*

# Alfred Johnson Skates



Alfred Johnson Tubular Ice Skates and Shoes have won their reputation by unequalled quality, design and construction, and a record of performance exceeding that of all other makes combined.

## Guaranteed to Give Absolute Satisfaction

For your protection insist on Alfred Johnson Skates. The full name signature is on every pair. Racing, Hockey and Rink Skates in various models for Men and Women, Boys and Girls. Largest Tubular Skate Plant in the world. BUILT ON HONEST PRINCIPLES.

*If your dealer cannot supply you send us his name and your order direct.*

| | |
|---|---|
| Aluminum Bronze | $14.00 |
| Nickel Plated . . | 16.00 |

Including Shoe attached as illustrated

*TERRITORY OPEN FOR DEALERS AND AGENTS*

**The Alfred Johnson Skate Co.**
2812 West North Avenue CHICAGO, ILL.

# ENERGY

## The Kind I Give Restores Brain and Body Cells

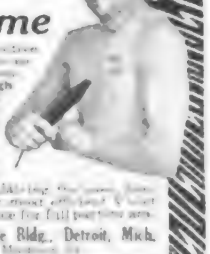
I can prove to you that you are only half as alive as you must be to realize the joys and benefits of living to full. I can show you how, without drugs or medicines or dieting, without excessive exercise, without giving up any of the pleasures of life, you can revitalize, re-energize, freshen every cell, tissue and organ of the body and become a **Giant** in health and mind.

## Send for My Book—FREE

The secret of wealth, health and happiness is fully explained in Swoboda's new book, "Conscious Evolution." In it hundreds of people tell what this great discovery has meant to them in increased earnings, increased ability to live the well rounded, wholly successful life. This great book will be sent free to all who are interested in greater personal power. Write today—now—before you forget. ALOIS P. SWOBODA 4010 Berkley Bldg., New York City

# Renulife VIOLET RAY

## Keep Well at Home



Investigate the wonderful **Violet Ray**, most effective health restoring agent known to scientific man—so you can treat yourself. You get the benefit of those wonderful volts of electricity—in the form of **High Frequency Violet Ray**—so quick, so sure, and pleasant and powerfully effective. Discover the remarkable, revitalizing powers of **Renulife Violet Ray** are carried to every nerve cell, tissue or organ—enriched, circulation increased, sensations resulting in Rheumatism, Neuralgia, Insomnia, Catarrh, etc., and disorders of circulation and nerves.

**BOOK FREE** Send for free book "Health" explaining the cause, how cured, and opinions of famous physicians about Violet Ray outfits for home use. Send postal card at once for full particulars.

**RENULIFE ELECTRIC CO., Inc., 1112 Marquette Bldg., Detroit, Mich.**
Chicago Office: Room 410, 175 W. Jackson Blvd.

**Canadian Renulife Electric Co., 1112 Netting Bldg., Windsor, Ont.**
Toronto Office: 347 Dundas St.

# Don't Send a Cent

So sure are we that you will say these most comfortable and good wearing shoes are a big bargain that we will send them without a cent in advance. Send coupon. Shoes will be sent by return prepaid mail. Pay postman $4.95 on arrival. If you are not entirely satisfied return shoes and your money, including return postage, will be refunded at once.

**Send Coupon**

Rush coupon. We only guarantee delivery at this price while stock lasts. Remember, don't send a cent with your order. Pay postman on arrival. Send now before you forget.

**Men's Durable Work Shoe**

Only one pair to a customer. Made of extra good selected gunmetal, calf skin vamp, dull calf skin top, bottom stock, medium weight, viscolized oak soles, viscolized counters, solid, quality. Sure to give excellent wear. Have a snug fit and comfortable roomy toes and heels and are perfect throughout. Sizes 6 to 11. Width Medium. Write size and Extra Wide. Pay $4.95 on arrival. Send today or you may be too late, for the supply at this price is limited. Use coupon now.

**FIFTH AVE. BARGAIN HOUSE, Dept. AO-134, New York, N.Y.**

I send $4.95. I will pay postman on arrival. If I am not entirely satisfied, I will return shoes and you will refund my money, including return postage.

Size ..... Width ..... Style No. 421

Name .....

Address .....



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Sounds a clear, musical warning—easily heard at any distance. Does not startle or offend. The pathway of your car is instantly cleared by the warning of

## The AERMORE Exhaust Horn

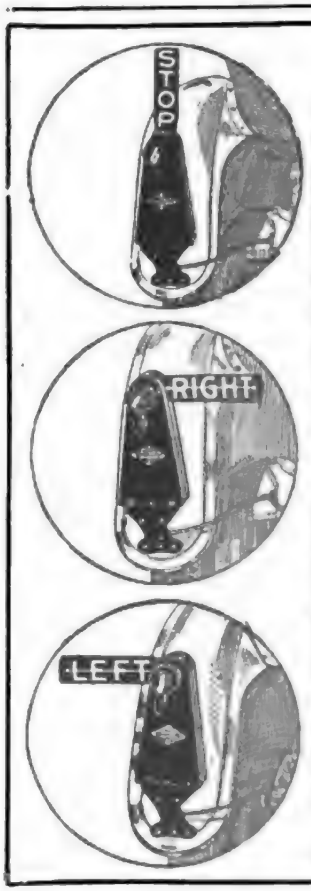
*"The Signal with a Smile"*

Built on the principle of the pipe organ. Easily installed without using batteries or wires. Operated by exhaust of engine—initial cost is the only cost. Lasts as long as any car.

Endurance, tone, workmanship and quality of Aermore Horns are absolutely guaranteed.

| | |
|---|---|
| 11-Inch Aermore Horn for Ford Cars . | $7.00 |
| 13-Inch Aermore Horn for 25 H.P. Cars . | 8.00 |
| 15-Inch Aermore Horn for 30 H.P. and over | 9.00 |

**THE FULTON CO.** 1910 St. Paul Ave. MILWAUKEE, WIS.




# Prevent Smash-ups

Arm signals fail at critical moments—are impossible in closed cars. Notify the car behind what you intend to do by using the **Kobzy Signal.** Operated by lever in easy reach on your steering post. A "Stop," "Right" or "Left" signal flashes up on your rear left fender to notify the driver behind—he cannot fail to see and heed it.

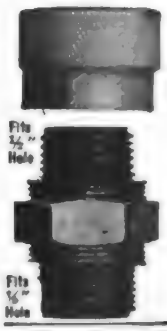
## *Kobzy Safety Signal*

**Lighted at night,** always visible, front and rear. Pilot light on control box shows driver if signal is on or off. Easily operated. Endorsed by leading clubs and required by law in some states. Easily attached to any car. Accidents cost more than the Kobzy—*prevent* them.

### DEALERS

Still some choice territory open — demand growing steadily — write or wire.

**Chicago Die & Specialty Co.**
**Dept. 300**
**327 S. La Salle St., Chicago, Ill.**




# Tests Cylinder Compression

### *Tells Which Cylinder Is Weak*

**The Duplex Compression Tester** fits either ⅛" or ¼" spark plug holes. Used with Schrader or Twitchell Tire Gage. Turning engine over by hand registers compression on gage; reveals the cause of troubles ordinarily detected only by tearing down engine. Tells if valves need regrinding; pistons or gaskets leak. Parkerized rust-proof steel. Fills big need. Sent postpaid for $1.00. Mention jobber's name if dealer; dealer's name if owner.

Retail Price $1

**Casey Hudson Company**
**383 E. Ohio St., CHICAGO**

# Good Tires for Less Money

**Guaranteed 4000 Miles.** Serviceable tires are reconstructed in our factory by our own dependable process.

| Size | Tires | Tubes | Size | Tires | Tubes |
|---|---|---|---|---|---|
| 30x3 .... | $ 5.45 | $1.60 | 34x4 .... | $ 8.70 | $2.60 |
| 30x3½.... | 6.45 | 1.75 | 34x4½.... | 9.95 | 3.00 |
| 31x3½.... | 6.70 | 1.85 | 35x4½.... | 10.95 | 3.15 |
| 32x3½.... | 6.95 | 2.00 | 36x4½.... | 11.45 | 3.40 |
| 31x4 .... | 7.95 | 2.25 | 35x5 .... | 12.45 | 3.50 |
| 32x4 .... | 8.20 | 2.40 | 36x5 .... | 12.70 | 3.65 |
| 33x4 .... | 8.45 | 2.50 | 37x5 .... | 13.20 | 3.75 |

**Reliner Free with each tire.** Send $2 deposit for each tire ordered, balance C.O.D. subject to examination. State whether S. S. or Clincher, plain or non-skid. Send full amount and save 5 per cent discount. Dealers wanted.

SERVICEABLE TIRE CORPORATION, 3254 Indiana Ave., Dept. 105, CHICAGO, ILL.

**Send 49 Cents for Two**

# Transparent Celluloid Triangles

4" — 45° and 5" — 60°

*And Our Complete Catalog*

**Spaulding-Moss Co., 32-34 Federal St., Boston**

*Distributors of Hermes Tracing Cloth*

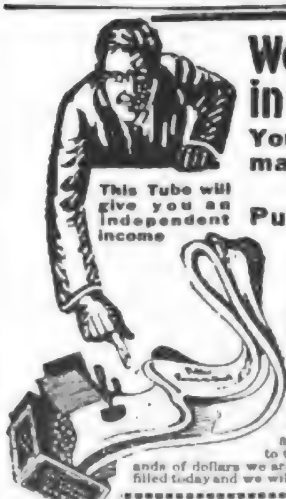
# FREE QUIT TOBACCO

**Safely. Immediate Results**

Get **Robust Health. Prolong Life,** avoid Nervousness, Indigestion, foul breath, **Heart Disease,** regain **Vigor, Calm Nerves,** mental strength, clear eyes. Send for **Free Booklet** telling how to conquer habit quickly, easily, **Safely, Scientifically, Permanently. Positively Guaranteed.**

**GUSTAFSON MFG. CO., Cleveland, O.**

SAFELY




# We Want Dealers in Every Locality

**You can make up to $20 a Day**

**SELLING**

**Public Puncture Proof**

## INNER TUBES

These tubes are guaranteed 6000 miles without a puncture or a new tube **Free.** You can make a good profit on every tube you sell and establish a business that will continue to grow and be profitable the year around. We will appoint but one dealer in a community, and all inquiries from our National advertisements will be referred to the dealer. Take advantage of the thousands of dollars we are spending—send in the coupon properly filled today and we will forward you our attractive proposition.

**COUPON**

PUBLIC TUBE MFG. CO., 35th & Michigan Ave., Dept. P, Chicago, Ill.

Please send without obligation booklet and information on Public Puncture Proof Inner Tubes.

**Name** .....

**Address** .....

**Town** ..... **State** .....

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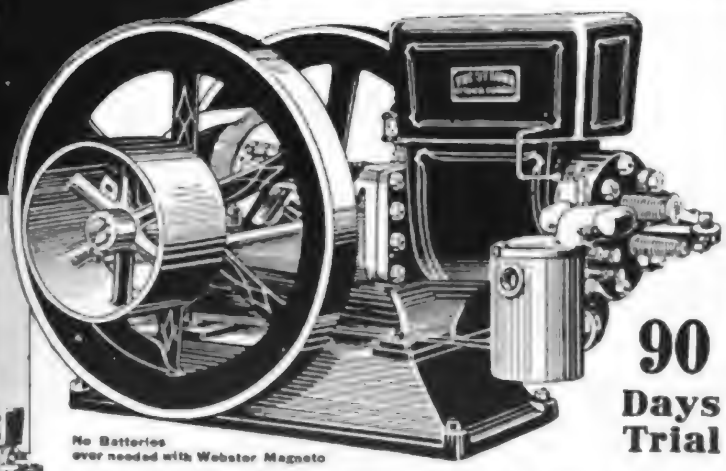
# Big Reduction on OTTAWA ENGINES



Let me send you an Ottawa to earn its own cost while you use it.
—GEO. E. LONG.

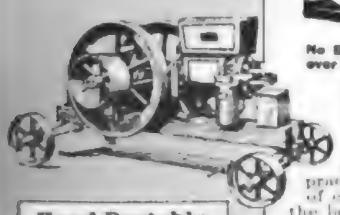
**After 6 Years**

The 6 H-P Ottawa engine I got six years ago is giving splendid satisfaction pulling 14-inch grist mill, grinding six to eight bushels of table meal per hour.
JOHN J. SIMMONS,
DeRidder, La.

**LOW PRICES**
**2H-P $39.85**
**3H-P $69.65**
**4H-P $92.25**
—All other sizes at proportionally low prices.

**90 Days Trial**

No Batteries ever needed with Webster Magneto

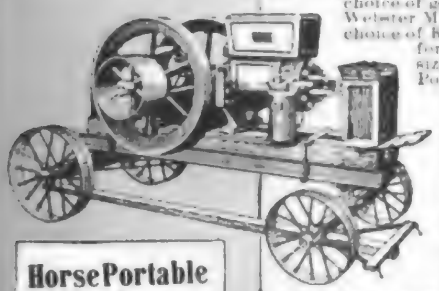


**Hand Portable Engines**
Sizes 1½, 2, 3, 4 and 5 H-P.

## Easy Starting—No Cranking—Fuel Saving

All materials are costing me more today than ever before and yet I have reduced my prices to practically pre-war level, by increasing the number of engines I build, thus making my engine factory the largest in the world selling exclusively direct to the user. When I lowered my manufacturing cost, I reduced my prices, and I give YOU the saving. I am no profiteer.

**Built to Suit You** I build my engines to suit your needs. You have your choice of governing or ignition systems and of Webster Magneto or Batteries. You have your choice of Kerosene (Gasoline, Distillate or Gas for fuel. My engines are built in all sizes from 1½ to 22 H.P. Stationary, Portable, or Saw Rig Styles.



**Horse Portable Engines**
Sizes, 5, 6, 7, 8, 10, 12, 16 and 22 H-P.

**Easy Payment Plan** It is now easier to own an Ottawa Engine than to be without one. With my new easy term plan of payment the most liberal ever made—the engine can pay for itself while you use it. You get the same engine whether you send cash or take a year to pay.

**Sent Direct to You** Deal direct with my big factory. Know who is back of your engine. Be sure you can always get repairs you may need. By dealing with me you will save from $20.00 to $250.00 and get a higher quality of engine.

**10 Year Guarantee—90 Days Trial**

You have 90 days (three whole months) to try the Ottawa Engine. They must make good all I guarantee and represent or I shall expect to have them returned in accordance with my guarantee. Try the Ottawa at your own work under any conditions, in the field I make you. You are safeguarded in every way. My 10 Year Guarantee is the most liberal made by any engine manufacturer.

My new special money-saving offer makes it easy for any honest man to own an Ottawa Engine. Send me your name and address on a post card today so I can make this new, most liberal offer to you. For nearly a quarter of a century I have been selling my engines direct from my factory to the user. Now thousands are going out every year because my engines make good, are easily started and easily operated by the man or boy who has little or no engine experience.

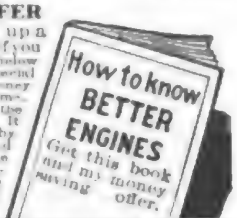
**Lowest Prices** Only made possible by the most efficient manufacturing, the finest of machinery and by the enormous quantity of engines built every day. When I reduced my costs I gave you the benefit by reducing the prices.

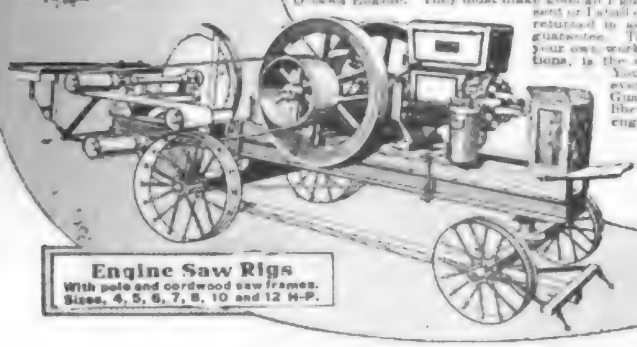
**Save Money** Now is the time for you to save on your engine—my prices are lower today than before the war. I can't keep them down long, so come now and make a big saving. Start sawing wood for yourself and neighbors and have a business of your own. It will cost you less now if you take advantage of my present Low prices.

**Superior Features** Don't choose an out-of-date engine—instead select the highest type engine on the market. It must have a speed regulator, Webster Magneto built-in, a crown pulley Automatic Fuel control, Semi-steel oil shield, Steam Engine base and cylinder, tube lubrication of pin and valves.

**SPECIAL OFFER**

You are passing up a great opportunity if you do not use the coupon below to get my latest special offer. It will mean money to you for years to come. I will include FREE, the latest "Why" Book. It contains articles by nearly one thousand men from every state in the union. My catalogue will also be sent you free, so send in the coupon below NOW.



**Engine Saw Rigs**
With pole and cordwood saw frames.
Sizes, 4, 5, 6, 7, 8, 10 and 12 H-P.

GEO. E. LONG, Pres.
OTTAWA MFG. CO.
539 King St., OTTAWA, KAS.

GEO. E. LONG, Pres.
Ottawa Manufacturing Company
539 King Street, OTTAWA, KAS.
Without obligation to me I would like to have your latest book "Why" and your engine catalog, also your new money saving offer.

Name.....

Address.....

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# FLORIDA ESTATE FOR SALE

One of the finest residence properties in the State of Florida, fronting 400 ft. on the Halifax River, and extending 2400 ft. through to the Atlantic Ocean, with 150 ft. frontage on the celebrated Daytona Beach.

About 10 acres, with abundant orange and grapefruit orchard in bearing, and large live oaks, bays, palmettos, etc. The house is new, has never been occupied, and contains 22 rooms, of which 11 are bed rooms, 2 large sun parlors, 2 large sleeping porches. Also 7 large bath rooms, 150-ft. veranda, water-softening plant, steam heat, etc. Living room is 20 by 47 ft.; dining room is 20 by 31 ft. Dock with deep water in front of house.

*Address Owner*

H. H. WINDSOR, 6 NORTH MICHIGAN BOULEVARD, CHICAGO, ILL.

**FREE** *for Trial*

**A Week to Play Before You Pay**

Don't miss this opportunity to get a Cornet, Trombone or Trumpet of the highest quality. Millard instruments are U. S. Government's choice for regimental bands. You may have your choice to play a week at our expense.

**Send for Catalog** There is no obligation. Get Free Trial Offer and easy payment plan. You can decide after trial if you wish to buy. Direct factory introductory prices. Write today.

**F. MILLARD COMPANY, INC.**
3612 Amelia St. (3) PLYMOUTH, MICH.

**450 CANDLE POWER LAMP FREE**

A Practical Christmas Gift for the Entire Family

In your home for 15 days. No money in advance. This beautiful new Radiolite—makes long winter nights a pleasure and makes your home bright and cheery. This amazing lamp is the evolution of years of study, experiment and expense. It is wickless, chimneyless, dirtless, smokeless, odorless, and waste-proof. It consumes less and gives more than any other lamp in creation, and costs only one cent a night to burn. Pays for itself in 90 days.

**Guaranteed for 5 Years**

Adopted by Schools, Churches, Halls, and all kinds of public places. Also Lanterns. Write today for our splendid offer and illustrated booklet. AGENTS WANTED.

RADIOLITE CO., Hunter Bldg., Dept. G, CHICAGO

**FREE to Auto Owners**

**Bulletin of Low Prices on Auto Accessories and Supplies**

**For All Cars**

Get this Free book to save money on everything you need for the care and repair of your auto. Supplies for all cars — *Everything Guaranteed* — sent on approval. You buy direct from Detroit, the auto center, and save money on every purchase. *Write today.*

**Guaranteed Tubes** 30x3 **$1.95**
30x3½, $2.25 34x4½, $4.45

**Harvard Auto Supply Co.** 165 Harvard Building DETROIT, MICHIGAN

**WATCHES On Credit**

**High Grade WALTHAM and ELGIN MOVEMENTS**

We sell the finest watches made. No matter where you live,

**YOUR CREDIT IS GOOD**

Better goods at lower prices. Write for Big Free Catalog of Watches, Diamonds, Jewelry, Silverware and our Easy Terms of Payment.

MILLER-HOEFER COMPANY
1136 Miller Bldg., Detroit, Michigan

**50c each VAN SPRING OILERS**

For Automobile Springs. Give perfect spring lubrication, prevent rust, stop the squeak, avoid broken springs.

**SAVE REPAIR BILLS**

Quickly snap onto springs — no bolts or screws — automatic in operation. All sizes for all cars. Mailed on receipt of price. Money back if not satisfactory. Good territory open for live agents.

VAN SPRING OILER CO., Dept. P. M.
222 No. Wabash Ave., CHICAGO, ILLINOIS

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US

**Herman Style 223**

**Modification of Army Last**

*Gun Metal Calf with Mat Top*

*Send for Catalogue*

THIS is the day of sensibly-shaped shoes for Men. The steadily growing demand for comfort, fine appearance and long, economical wear has at last won a victory.

The War itself showed the incomparable value of the true foot-form type of shoe.

Herman's Shoes, made on the famous Munson U. S. Army Last—also in shapely civilianized modifications of it—are recognized everywhere for their preeminent fitting qualities and top-grade construction.

For business wear, for outdoor enjoyment and for every other use in which foot-happiness is a prime consideration, Herman's Shoes are unexcelled.

Sold in 8,000 retail stores. If you are not near one, we will fit you correctly and quickly through our MAIL ORDER DEP'T at Boston

**JOS. M. HERMAN SHOE CO.**

801 Albany Bldg.

BOSTON, MASS.

# LEE UNION-ALLS

THE MOST POPULAR WORK GARMENT IN AMERICA

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# DIAMOND BARGAINS from IGNATIUS BARNARD

I am the only Diamond dealer in the world who buys Diamonds for cash from people who need the money, from estates, auctions, etc. I only buy where I can get the gem 'way below its wholesale value. Then I add a small profit based on enormous volume of sales. I have no "overhead" expense to speak of, so I can guarantee my price to be **less than wholesale!** And I offer you **everything** in new, fashionable gold and platinum mountings at the actual factory **cost.** Look at the following bargains, selected at random from my enormous stock of fine Diamonds:

| Carats | Description | My Price |
|---|---|---|
| 2¼ | Blue Wesselton, good quality | $488 |
| 1¾ | Steel White, absolutely perfect | 688 |
| 1½ | Good Perfection, light brown | 298 |
| 1.37 | Steel Blue, slightly imperfect | 315 |
| 1¼ | Blue Wesselton, good perfection | 325 |
| 1.18 | Fiery Brilliant, commercial white | 288 |
| 1.06 | Steel Blue White, absolutely perfect | 475 |
| 1 | Steel Blue White, imperfect | 135 |
| 1 | Eye-perfect top light brown | 199 |
| ⅞ | Blue Wesselton, eye-perfect | 388 |
| ⅞ | Exquisite Blue-Brown, eye-perfect | 215 |
| ¾ | Steel Blue, slightly imperfect | 250 |
| ¾ | Jager's Violet Blue, eye-perfect | 299 |
| ⅝ | Eye-perfect top light brown | 144 |
| ⅝ | Blue Rivera, very fine quality | 200 |
| ⅝ | Blue Wesselton, slight imperfection | 133 |
| ⅝ | Blue White, carbon imperfections | 67 |
| ½ | Jager's Violet Blue, absol. perfect | 199 |
| ½ | Blue Wesselton, eye-perfect | 166 |
| ½ | Steel Blue, very slight imperfection | 125 |
| ½ | Blue White, carbon imperfect | 75 |
| ⅜ | Jager's Violet Blue, eye-perfect | 129 |
| ⅜ | Blue Wesselton, very fine quality | 99 |
| ⅜ | Eye-perfect crystal white | 75 |
| ¼ | Jager's Steel Blue, eye perfect | 89 |
| ¼ | Blue Wesselton, very slight imper. | 69 |
| ¼ | Jager's Violet Blue, eye-perfect | 15 |
| ¼ | Blue White, imperfect | 9 |

## The Rings Illustrated:

| No. | Description | My Price |
|---|---|---|
| 1 | Steel Blue Diamond, 14k ring | $ 50 |
| 2 | ⅜ carat Blue Wesselton Diamond | 100 |
| 3 | ⅝ carat Steel Blue Diamond | 150 |
| 4 | 1 carat Top Light Brown Diamond | 200 |
| 5 | ½ carat Blue Wesselton Diamond | 133 |
| 6 | ¾ Jager's BLUE PERFECT Diamond | 300 |

## I Ship for FREE Inspection and I Protect You with a REAL Money-Back Guarantee

Send no money, merely write me what diamond and mounting you select from my free Bargain List or this advertisement, and I will send it to your express office or bank for free examination. Written guarantee of carat weight and value and contract to refund your money sent with every diamond.

**Write for My FREE Bargain List**

and illustrated style Book of fashionable mountings mailed to you weekly upon receipt of your name. Don't buy your diamond until you have compared my prices and learned the protection afforded by my money-back guarantee. Write today, a postal will do.

**IGNATIUS BARNARD OF CHICAGO**

**Dept. 1309-C, 36 S. State St., CHICAGO, U. S. A.**


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# Xmas Gifts at Wholesale Prices

WHEN you buy direct from the house of KRAUTH & REED, you save all middlemen's profits. We sell direct to you from our big Gold Shops—no extra expense, no extra profits. We employ no salesmen, and we have no branch stores. We save you all of this extra expense, and give you the highest values at lowest prices.

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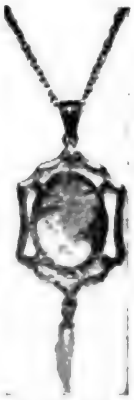
Genuine cameo tie pin.
No. 195—
Price $2.75

Gold finished knife with diamond edge and steel blades.
No. 196—
Price $1.50

Solid gold cameo La Valliere with neck chain complete.
No. 191—
Price $3.75



Lady's Tiffany ring set with a 1-K HAWAIIAN im. diamond—the greatest discovery the world has ever known.
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Gentlemen's bicker ring set with a 1-K HAWAIIAN im. diamond—the greatest discovery the world has ever known.
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Lady's wrist watch.—No. 1001....Price $7.50

Beautiful gold finished photo locket.
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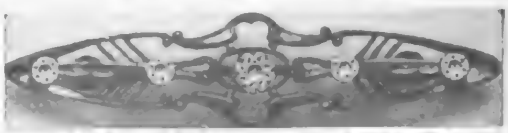

Lady's brooch pin in beautiful silver effect.—No. 14709—Price $2.00

Round Locket set with HAWAIIAN im. diamonds.
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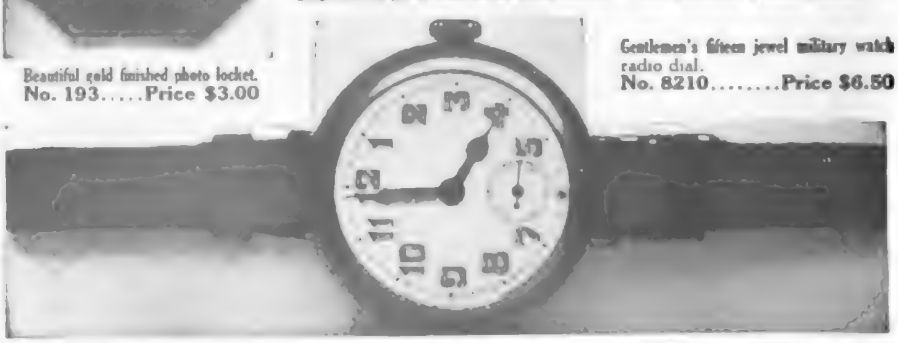

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# A Home and Income

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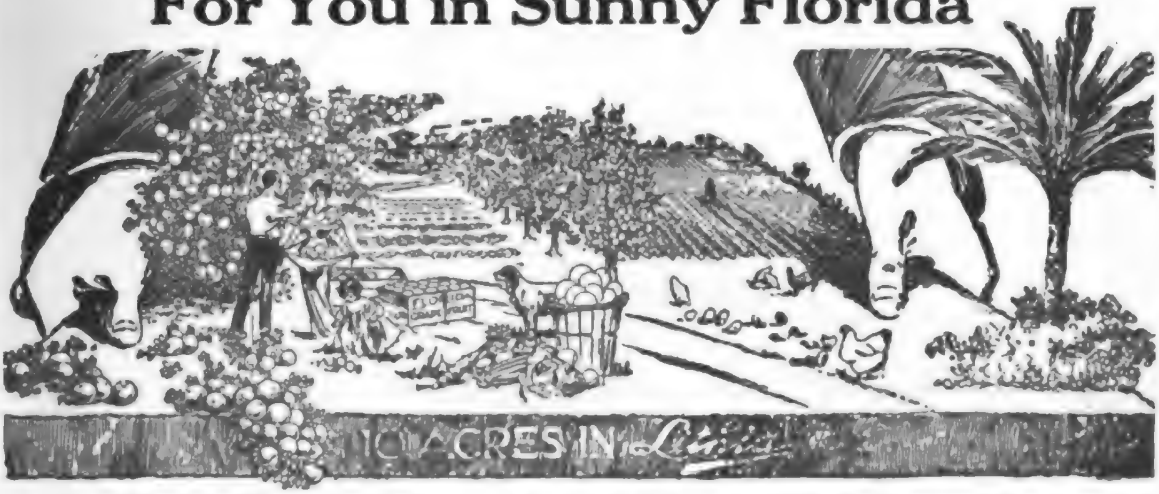


## Be Independent—Own a Grapefruit and Orange Grove—A Truck or Poultry Farm. Increase Your Income

### You Can Start a Grove Today Under Our New Plan

Develop a profit-earning fruit farm without leaving your present position—provide for your future. A small payment now and a few dollars invested each month should reap large and increasing dividends from year to year. You can now secure the land you want on payments as low as **$1 per acre per month.**

A profit-producing fruit grove is a permanent investment and provides protection against old age.

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**WE HAVE IT—ANY SIZE FARM**

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If you want to remain in your present position for a few years we can develop a grapefruit and orange grove for you. When you are ready we will clear your land, furnish fruit trees, plant and care for your grove until you are ready to look after it.

### We Raise Our Own Guaranteed Citrus Trees in Our Own Nurseries

This insures every purchaser the best fruit trees that can be grown. This also insures a successful grove. We can save you money on planting and caring for your grove.

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IT COSTS YOU NOTHING TO LET US PROVE TO YOU that we have the land you want—in the location you want—at a price you can afford to pay and on the easiest terms you can imagine. Let us show you.

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Size: Greatest inside diameter 12½ inches—inside height, 10½ inches. Color, pure white. Weight, 12 pounds. Shipping weight, securely packed, 22 pounds.

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Suitable for any country—any climate—winter and summer—in houses, camps, boats, apartments, hotels or boarding houses—city or country.

Will keep your eggs, fruit, butter, meats, bread, cake, milk, vegetables and other foods in cool, fresh, sanitary and wholesome condition this winter, right in your warm kitchen, bedroom or any other room where dry air circulates.

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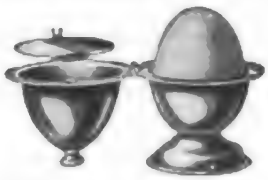
Served in



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YOU get the true flavor of an egg—soft, medium or hard boiled—when you eat it piping hot from the Perfection Egg Cup and Cutter. The shell is cut without crushing—the hotter the egg the cleaner the cut. You can keep one half of egg covered and hot while you eat the other.

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This dainty, silver-plated cup—no larger than an ordinary egg cup—is handsome in design and an ornament to any table. Set of six makes a beautiful gift. Send $1. Use cup a week. If not pleased return it and we'll return your dollar. Set of six for $6. Regular prices $1.50 each or $9 a set. Sterling Silver $12 each.

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Protect your checks as you would your life or valuables with the little check perforator. No more changing of checks, perforate full length in one operation.

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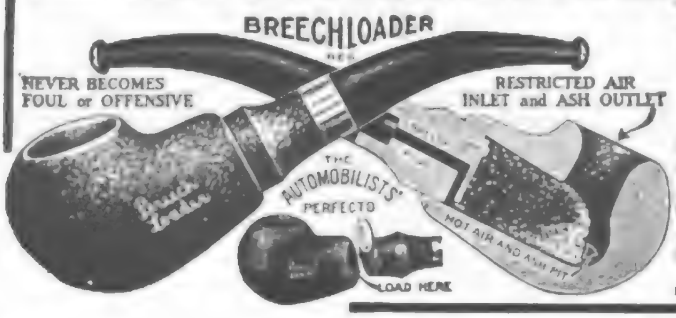


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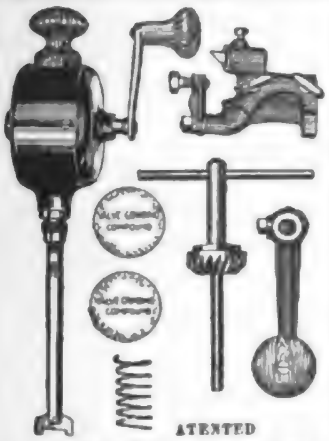

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## Easily—Quickly— Economically

Eliminate 80% of your engine trouble caused by carbon and leaky valves. Keep your motor young, right and snappy—hitting on all four. Stop that ruinous carbon knock. Get all the power from your motor—stop that leaking that eats up the gasoline. Grind your own valves, easily and quickly and save money. Why wait until the garage can do the job and lay up the car for several days when you can do the work in an hour as good as any one can do it. One job saves the cost of the tools and the future jobs are money saved.

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The outfit contains the Sioux Valve Grinder, Ford Valve Refacing Tool, Ford Valve Seat Reamer, a spring for jumping and a liberal supply of valve grinding compound. The tool set will outlast two Ford motors.

**Do the Job in An Hour** An hour of your leisure time and the job is done. You don't have to be mechanically inclined or know motors. Our direction book pictures every move, has 27 illustrations and is worth its weight in gold to every Ford owner. A job of this sort would cost from $7 to $10 at any garage. This set especially designed for Fords and other small engines is a duplicate of the famous "Sioux" tools used by garages the world over for all makes of cars. Ask any garage man what he thinks of "Sioux" Tools. He'll tell you they "can't be beat."

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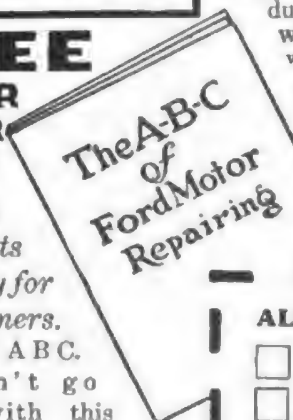


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When you step up to the wash basin with your hands covered with dirt, grease, paint or metal stains, just rub in a little SKAT Hand Soap and out rolls the dirt. Skat gets right into the pores and leaves the skin soft and white—no matter how tender.

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**SKAT HAND SOAP**

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burns Kerosene or Gasoline without adjustment. Saves eyes.

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***ORDER TODAY***

***We Help UmakeM Members Make UmakeM Money***

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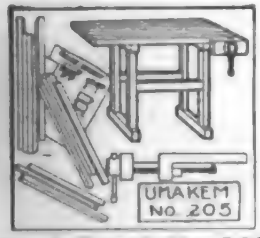


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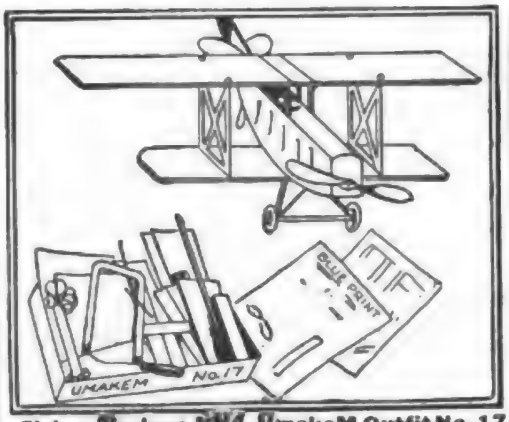
46 inches long, 18 inches wide. Complete material for making this sturdy bench including blue print. Weight 96 lbs. . . . **$9.00**

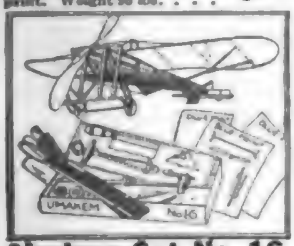



**Flying Airplane J-N4, UmakeM Outfit No. 17**

containing all wood, coverings, aluminum, steel wire, Para rubber, fittings, blue prints and full instructions, together with all necessary tools. Weight 24 lbs. **$3.00**

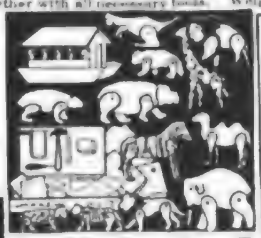
**60-Piece Set No. 3**

containing high quality tools, designs, 3 ply wood, [illegible] needed [illegible] Weight 7 lbs. **$2.00**




**Airplane Set No. 16**

A Workchest containing work table, miter cutting board, gauge, drill, steel hammer, Model Maker's steel square, wood and all fittings for building one Bleriot Model Flying Monoplane. Full set blue prints and directions. Weight 10 lbs. . . . . **$10**

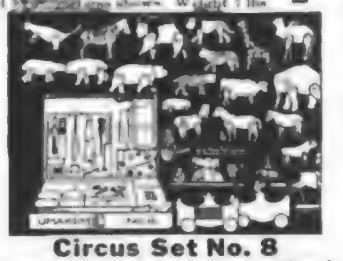


**Noah's Ark No. 7**

contains tools and all materials with instructions and designs to make this 28 in. Noah's Ark and 24 animals 2 of each). Weight 20 lbs. . . **$5.00**

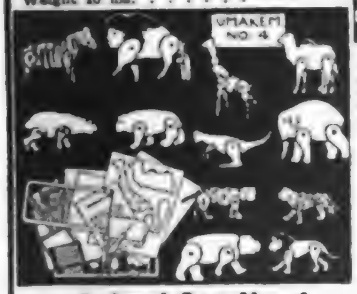
**Sewing Stand No. 203**

This set contains 3 ply wood, designs and hardware for making this beautiful sewing stand. Weight 13 lbs. . . . . **$2.00**



**Circus Set No. 8**

Containing 11 tools, designs, colors, special wood, complete material and instructions for making a $20.00 circus set as shown, consisting of Circus Wagon, Animal Wagon and 19 Painted Wild and Domestic Animals. Weight 22 lbs. **$10**



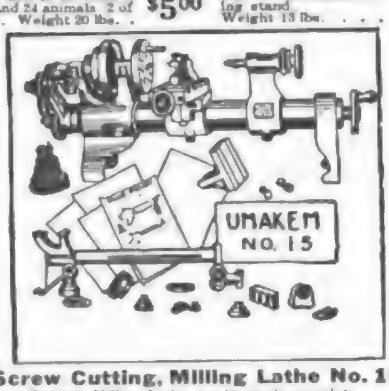

**Animal Set No. 4**

Boxed outfit contains Steel Saw Frame, Blades, Awl, Water Colors, set of Design Sheets, 3 ply Wood, pins and washers and complete material for making 12 jointed Wild Animals. Weight 5 lbs. **$2.00**

Set No. 5 similar but material makes 7 domestic animals. Weight 3 lbs. . **$1.00**

**Toy Set No. 6**

This outfit contains tools, all raw materials and fittings for making one set of above toys worth $6.00. To make more toys all you need is more raw materials. Wgt. 7 lbs. **$3.00**




**Screw Cutting, Milling Lathe No. 15**

Screw Cutting, Milling Lathe can be made complete from the above outfit No. 15, which includes all castings and blue prints. Size 5 ft. 1 in. x 8 in. Wt. 100 lbs. **$25**

**Doll's House No. 9**

Outfit contains tools, designs and all materials to make this $15.00 Doll's House. 24 in. high. Weight 25 lbs. **$5.00**

**Design Sheets, 10c each**

No. 2 to 8 shown in No. 3 Set.
No. 9 Action Toy Village Blacksmith.
No. 112A to 112D shown in No. 4 Set.
No. 111A—111H, Domestic Animals.
No. 1A Clown on Kicking Donkey.
No. 10 Doll Furniture Set.
No. 108, 103, 123 shown in No. 6 Set.

**Blueprints, 25c each**

No. 140 Large Model War Tank.
No. 128 Circus Wagons shown in No. 8.
No. 132 Ark shown in No. 7.
No. 205 Work bench shown No. 205.
No. 208, 3 prints each 25c Airplane No. 16.
No. 209, 2 prints each 25c for J. N. 4 Plane.

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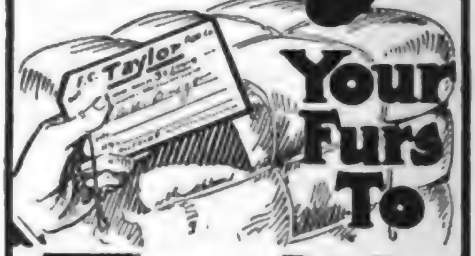


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Ship where all the "old timers" ship—to America's greatest fur buying and selling organization. And the check will **satisfy** you, because Taylor always grades your pelts **up.** Find out **why** more than a million trappers have shipped to Taylor. Ship furs you now have—one or a bundle. But play safe. Nobody knows how long prices will stay where they are. **Make sure you get yours—now!**

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### For Convenience or Profit

From any alternating current lamp socket with the Cambridge Rectifier. For home or garage use. As simple as turning on a lamp and fully guaranteed.

Quickly saves its cost and doubles the life of your battery. Always ready when you want it. Rectifier Bulletin R sent on request.

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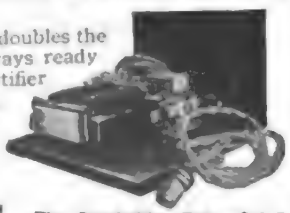

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The Wilbur shotgun peep sight will revolutionize wing shooting; no excuse for missing; game birds or clay birds. Patented and perfected by an old trap and field shooter. Teaches the art of wing shooting; will increase the score of the trap shooter; corrects the faults of old shooters; shows how to lead your birds; compels proper handling of gun; puts the shooter down on his gun where he belongs; proves the correct fitting of your gun.

Fixed steel frame contacts and rigidly on breech of barrels. 12 and 20-GAUGE ONLY. Sent made for single barrel or pump guns. Postpaid, $2.50.

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Search wherever you please—if you can duplicate our offer anywhere for one cent less than $25.00—or if for any reason you are not perfectly satisfied within 30 days—we will refund your money. Just think—23 jewels, guaranteed movement, perfect timekeeper, in beautiful 12 size, each case guaranteed to wear 20 years—likely to last a lifetime—for **only $12.00.** No. W 202. Also same, except 14K solid gold case, $40 value—our price **only $20.00.** No. W 202. Satisfaction guaranteed. **Order from this Ad.** Watch sent subject to examination—if you wish—no money in advance. No risk. **Write today.**

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Our graders have years of experience. Their honesty is the basis of our 30 years of success.

WE KEEP YOU POSTED. Get our price list. Shipping tags and trappers' information SENT FREE. *Write today.*

**McCullough & Tumbach**
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# TRAPPERS

## YOU WILL DANCE

with joy when you get your returns for furs shipped to the Abraham Fur Co., the house that never disappoints fur shippers. Our expert graders in our "Take-up" Department have positive instructions to see that every shipper gets a liberal grade on every skin and are held accountable for all furs taken up by them. Our prices are the highest ever known and now, more than ever, you need the services of an old established, reliable and experienced fur house. The are no fur houses in the world which have these qualifications to a greater extent than the Abraham Fur Co.

## SHIP EVERY PELT YOU HAVE—NOW

We urge you to send us your next shipment of furs and let us prove to you that our prices are the highest—our grading the most correct and liberal and our returns most prompt. We have been in the fur business continuously for 43 years and we have made more staunch friends and have a larger percentage of regular old shippers than any other fur house in the U.S. These facts justify our claims that Abraham is America's Leading Fur House. Other fur houses make these same claims, but it is generally conceded by our competitors that the hardest fur house to fight against for business is the Abraham Fur Co. Why? Because our returns are always top of the market and any fur house that wants to keep pace with us will have to go some and be on the job early and late.

**SUPPLIES** Get one of Abraham's wonderful Smoke Pumps—$2.00 postpaid, with extra extension $2.10. Abraham's Animal Baits and Trail Scent $1.00 per bottle, 3 bottles for $2.50. Best bargain in Rain Coats $5.95. Get our free book "Fur Facts" and Trappers' Supply Catalog. It's free; drop us a card today. Weekly Reports—Tags and other literature—also free. Get the whole business with one postal card—write today.

# Abraham Fur Co.

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**St. Louis, U.S.A.**

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# Biggest Check for Your Pack

Ship your furs to Becker and you will be just as well satisfied as Harve Garriot, who says: "For the past 32 years I have shipped you all my furs, which runs into many thousand dollars. You have always paid me more, your sorting and grading has always been absolutely fair."

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Trappers and Shippers—don't wait, write in to-day for Rogers big improved Trappers' Guide—it's *free*. The biggest, best work of its kind—hang the cover on your wall—it's full of color and action—meant for real outdoor men.

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We pay $7.00 to $11.00 a pair and express charges. Big Profits. We furnish guaranteed high grade stock and buy all you raise. Use back yard, barn, cellar, attic. Contract and Illustrated Catalog FREE.

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We charge no commission whatsoever for handling your furs—and we send you spot cash the day your shipment is received.

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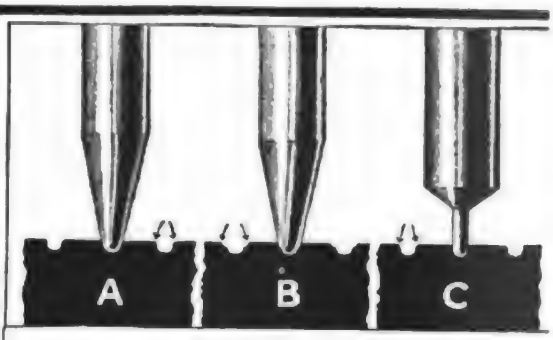


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CLEAR AS A BELL

### Semi-Permanent Silvered PHONOGRAPH

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## Make your records last longer and improve the tone!

THE ordinary steel needle fits the record groove when it is new. It wears rapidly, however, and being tapered tends to shear off the sides of the groove as shown above. This results in poorer tone and shortened record life.

Sonora Needles have parallel sides and as they slowly wear down they fit the groove perfectly, *always keeping the record in ideal playing condition.* Sonora Needles are designed for use on ALL MAKES of steel needle records.

These Sonora Needles *play many times,* are more economical, more convenient, save constant needle changing and MELLOW THE TONE. These needles give the maximum of satisfaction and are the most economical ultimately.

**FREE!** A sample needle will be given FREE so that you can prove its merit for yourself. Write for yours today.

*Three Grades*
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GEORGE E. BRIGHTSON, *President*

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Toronto Branch: Ryrie Building

**CAUTION!** Beware of similarly constructed needles of inferior quality!




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Make it a Flexible Flyer Christmas! The cleanest, liveliest, most healthful sport of the season—sledding with the famous FLEXIBLE FLYER. Its patented, non-skid runners which grip ice or snow make steering easy and coasting safe, comfortable and fast. The new steel front takes up shock, adds strength and prevents splitting of seat and rails. Saves shoes and prevents wet feet.

Seven sizes—38 to 63 inches long. Look for the *name and flying eagle* trade mark on seat. None genuine without it.

**FREE** Cardboard model shows how the Flexible Flyer steers. Write for it.

**S. L. Allen & Co.** Box 1101G Philadelphia

# *Flexible Flyer*

***—the famous steering sled with non-skid runners***

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Machines play all records, have a wonderful tonal quality, excelled by none. No need now for any family to be without a phonograph because of the cost. THE MAKAFONE solves the problem. BUILD IT YOURSELF AT LESS THAN ONE-FOURTH REGULAR COST, but equal to the high priced cabinet machines. Free Records with each outfit. SEND TODAY FOR FREE CATALOG and full particulars of our wonderful offer. *Many a manufacturer got his start in this way. Why not you? Build machines and sell to your friends. Ask us about this.*

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Gentlemen: Please send me full particulars of your Makafone proposition, without obligation to me.

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*References: First National Bank of Chicago.*

**Specifications**
Best quality soft leather vamps, whole quarter [illegible] full leather [illegible] solid [illegible] leather [illegible] smooth inner side. U. S. [illegible] steel grained leather counter. [illegible] Wear-proof lining. [illegible] wherever wear comes. An all-occasion shoe of real [illegible] quality. Mail coupon NOW. [illegible] on approval.

**Fit Guaranteed**
If not sure of size, place foot on piece of paper and outline with pencil.

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Send on approval one pair shoes, "President" model. I will pay $8.35 plus postage, on arrival. You are to refund my money, with postage, if I am not pleased. *Size*.....

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Another exceptional value in Men's seamless socks, *for this* [illegible] last months solid cut last; don't delay. Medium weight, suitable for your [illegible] wear; regular 35c value; our price $2.15 for half dozen, 12 pairs, postpaid. White or natural color [illegible] for wear, no dye, no fading. Black, too.

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Colors: White, Natural, Black

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## Into Millions of Homes

*Safe—Economical*
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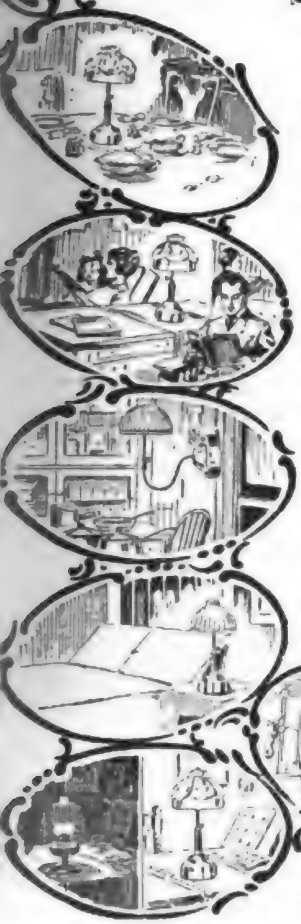
**Turns Night into Day with a Light as White as Daylight**

Gives a brilliant glow, exceptionally illuminating yet soft and restful to the eyes. Ideal for city and country homes, cottages, camps or wherever a bright, dependable light is needed.



Style No. 92 Portable Lamp

## Lights with One Match

The old time bother of lighting with alcohol torch has been entirely eliminated in this patented Modern Diamond Light. A newly perfected burner makes it possible to light either lamp or lantern with one match.

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Generates its own gas from common gasoline which is contained in base of lamp and forced to burner by air pressure. A twin mantel burner gives a 400 candle power brilliancy.

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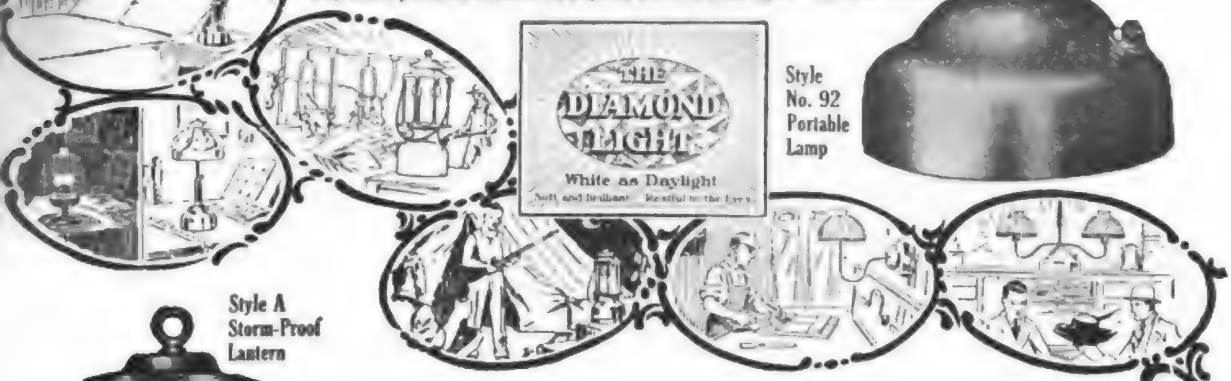

Style A Storm-Proof Lantern

# Sales Agents Wanted

Unlimited opportunities open for the sale of the Diamond Light. Sales Agents wanted in every city, town and country district to act as our exclusive representatives. This is an opportunity to build an independent business selling an article of unexcelled quality and universal usefulness.

## Makes $50 to $100 Weekly

Agents marvel at the ease with which the Diamond Light sells. Hustlers easily make $10 to $25 daily. Every customer a booster. Hundreds of letters received expressing pleasure and satisfaction over purchase of Lamp or Lantern. One lady wrote: "Lamp is a dandy." Another said: "Highly satisfactory. Giving splendid service." Another wrote: "They are great!" "All you advertise them to be, and more."—"Lamp is fine!"—"Very much pleased."—"You couldn't buy them back at any price if we couldn't get more."—"Greatest Light in the World." "Your lantern sure is a dandy."

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Build a business of your own on our capital—get the benefit of our advertising. Here's a Lamp with a guarantee and a reputation behind it. Active agents furnished complete sample outfits free. Write immediately stating territory wanted—NOW while you think of it.

**Akron Gas Lamp Company** 112 Steese Bldg. AKRON, OHIO

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WHY suffer nervousness, headaches, rheumatism, skin diseases or any other ailment that keeps you from enjoying perfect health and a clear, beautiful complexion? The marvel of the age is the discovery of the curative value of electricity in treating the human system. Its mysterious, magical power has now been harnessed in its greatest curative form for human use—Violet Rays. A few minutes each day in your own home will not only relieve you of many annoying ailments, but will literally insure you an every-day vigorous, abounding health and beauty. Violet Rays penetrate every cell of the entire human system and bring almost instant relief. For blackheads, pimples, eczema, blotches and other blemishes to bodily beauty and complexion, Violet Rays produce amazing results.

## Not a Vibrator

Don't confuse the VIOLETTA with Vibrating Machines. It is not a Vibrator. It does not contract the muscles or shock the nerves. Its magic rays pass completely through the body, producing "cellular massage," known to be far more beneficial than muscular massage. It leaves no soreness after use—only delightful, agreeable relief.

## VIOLETTA Violet Ray Machine

### Try VIOLETTA For

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| Boils | Lumbago |
| Blackheads | Nervousness |
| Catarrh | Neuralgia |
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| Dandruff | Pimples |
| Deafness | Rheumatism |
| Earache | Skin Diseases |
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These and many other ailments are relieved as if by magic. Violet Rays penetrate to every cell, tissue and nerve in the system. It soothes or stimulates, as desired. Remember, there is **NO shock or pain** in its use. Harmless and painless even to infants. Thousands of small babies have been successfully treated with it.

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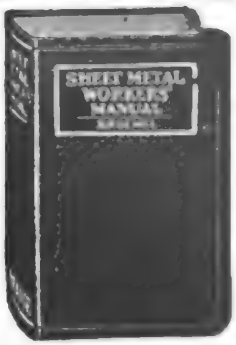


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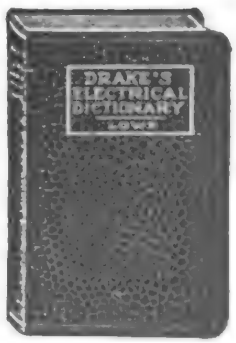


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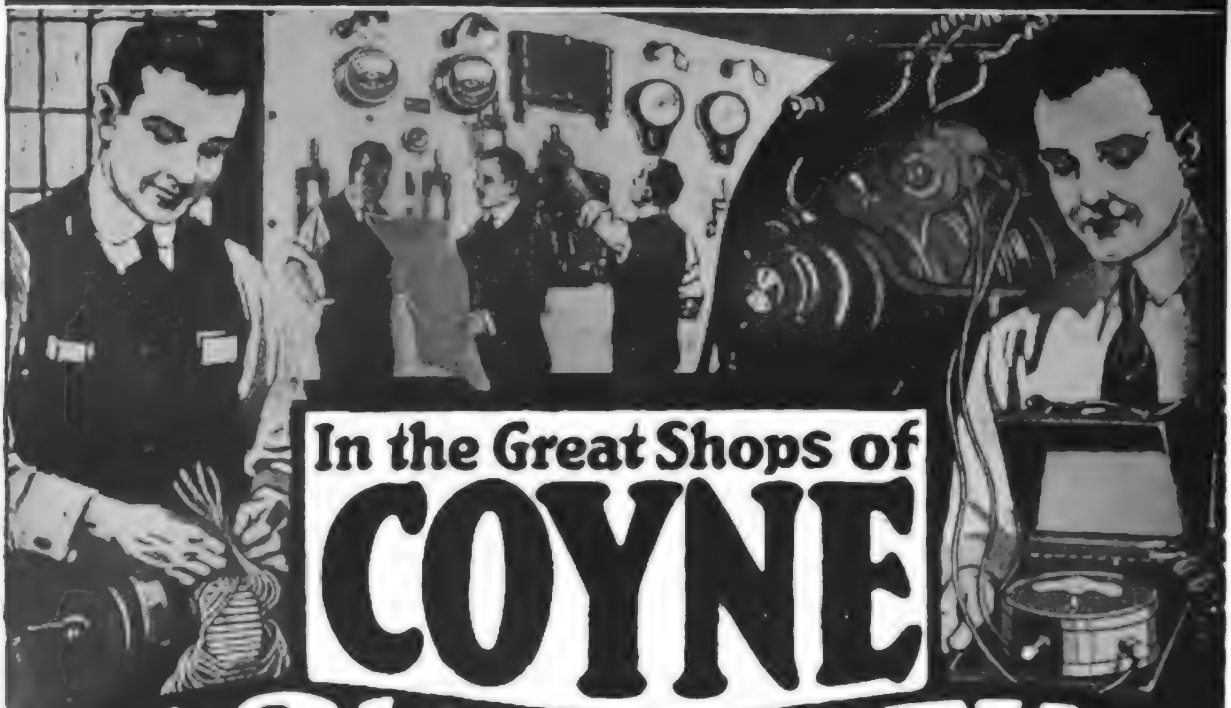

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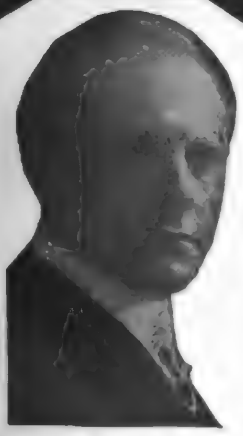

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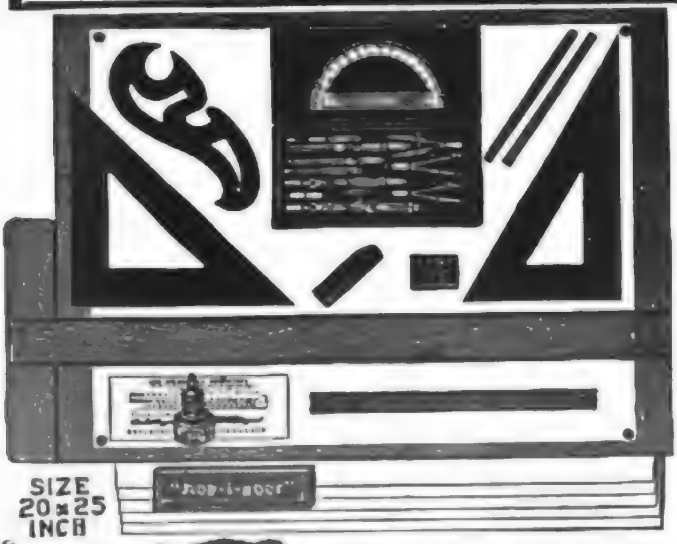


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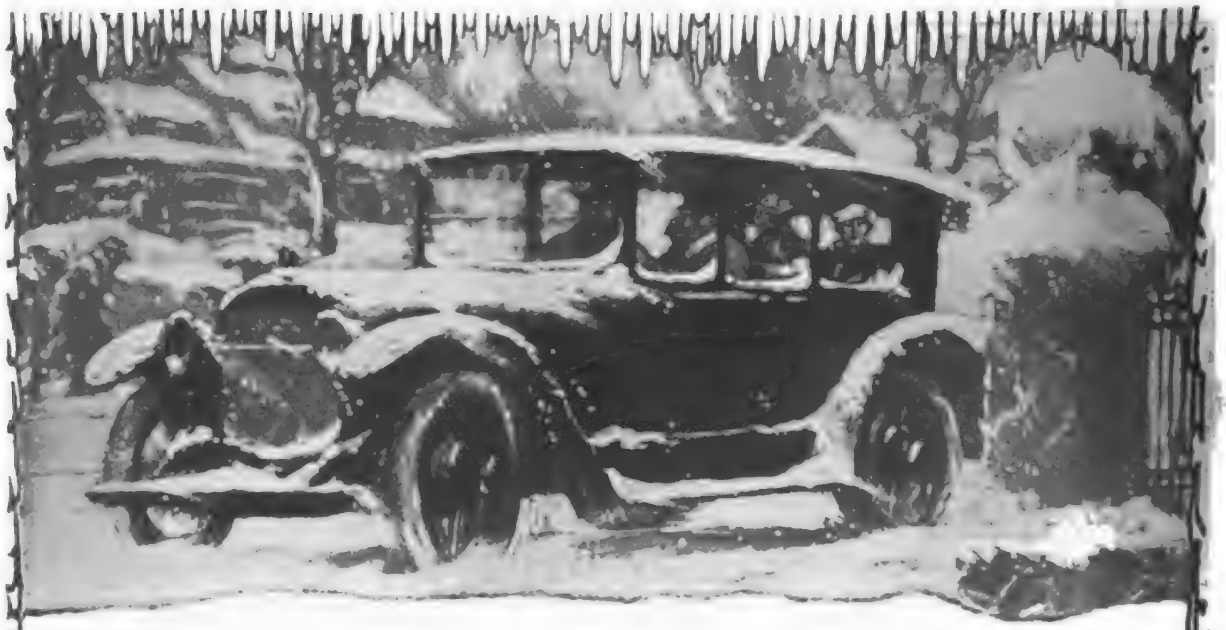

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